

Deepfreeze unit chills valve insert rings to attain shrinkage for production line assembly. Page 94

# STEEL

The Magazine of Metalworking and Metalproducing

## FEBRUARY 28, 1944

Volume 114—Number 9

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# a "GET-TOGETHER" at 1:30 A.M.



## helped speed a new assembly for the Navy's Bureau of Ships

**A West Coast ship builder** had appealed to GRAYBAR for a special type of relay enclosed in a watertight box, to meet Navy specifications. At the time, no manufacturer was set up to make this new assembly.

**Graybar's separate contacts** with a relay manufacturer, a maker of phenolic insulation and a builder of watertight boxes pointed the way. Individual parts were shipped to GRAYBAR from three sources.

**Working after hours** at a work bench, GRAYBAR's local representatives made the "get-together" to complete the sample assembly. The very next morning, it was submitted for approval.

**Official GR drawings** by the Bureau of Ships established the assembly as acceptable. GRAYBAR was then able to arrange with a supplier for regular production to meet Navy orders.

**IF YOU REQUIRE** electrical sub-assemblies to be installed in combat equipment, GRAYBAR'S close liaison with several hundred competent manufacturers may mean equally fast action for you. If your need can't be met "out of the catalog," we can seek out someone to build it.


In addition, by getting electrical parts that go together in use from a single source, you save time, reduce paper-work and make it easier to schedule deliveries.

3502

**MOBILIZED MATERIALS**  
No. 15 of a series of actual examples of GRAYBAR service, providing electrical materials to be installed in ships, planes and other war products.

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## Relief Bill for the Greedy?

Almost every public comment on the spectacular revolt of Senator Alben W. Barkley against "unjustifiable assault" by the President has stressed the political implications of this historic event. Unfortunately, the political aspects of the case cannot be divorced from economic and social issues, and for this reason the dramatic explosion of last Wednesday is of direct significance to American industry.

The break between the President and his faithful wheelhorse in the Senate had been brewing for months. The final straw was the President's sarcastic and manifestly unfair veto message on the tax bill. Probably Mr. Barkley could have stomached much of this extraordinary document if it had not been for one far-too-clever sentence. The President had charged "This is not a tax bill but a tax relief bill, providing relief not for the needy but for the greedy."

Obviously the Kentucky Senator could not take this insult "lying down." Nor should the American public take it lying down. Nor should American industry, which to the President's mind comprises the "greedy" element of society, take it lying down.

For the Chief Executive of this nation to characterize this particular tax bill—imperfect as it may be in many respects—as a relief bill for the greedy at a time when private enterprise (which he implies is greedy) already is paying tax rates far beyond anything this nation had ever thought possible is an outrage. As an intended political slogan for a fourth-term it may have merit in the eyes of some of the President's left-wing advisers, but as a statement of fiscal policy it is unfair and unwarranted.

The truth is that the financial administration under Mr. Roosevelt has been lamentably weak. He has opposed numerous suggestions of Congress which, if adopted, would have given us a much better tax structure than we have at present. In trying to throw the entire blame upon Congress, he was hitting below the belt.

Every taxpayer—individual and corporate—is paying much more in taxes than would need to be paid if our government fiscal affairs were being administered competently and fairly. Every taxpayer is paying more than need be if the President were not continuing many non-war frivolities unnecessarily. Every taxpayer is paying more because the President insists upon keeping class feuds alive.

The President apologized to Barkley, but does he fully realize the gravity of his mistakes?

---

**WHAT IS INVENTION?** During the past quarter-century American industry has been substituting organized scientific research for its one-time hit-or-miss reliance upon the genius of individual inventors. The research laboratories implement the imagination of the inventor with the results of systematic experiment.

This trend is tremendously important. It has speeded the development of new processes, materials and products. Carried forward intelligently, it

will raise the standard of living and contribute heavily to the well-being of the people.

But have our laws kept pace with this development? We fear not. The United States Court of Appeals has upheld the Patent Office in refusing a patent because the item for which a patent is sought is the outcome of co-operative research in a laboratory and not of the inventive genius of an individual. To grant patents in this case, rules the court, is to "reward capital investment and create monop-

olies." The intent of the patent system, it contends, is to protect individual inventors.

We need a better understanding of the implications of industrial research and fair laws to deal with this new highly constructive force. —p. 68

**IMPROVES GOOD STEEL:** Last December when Charles F. Kettering was addressing the annual meeting of A.S.M.E. he referred to an interesting experiment with shot blasting. He recalled that several years previously his laboratory associates tested samples of standard spring steel supplied by eight or ten steelmakers and found that all of them broke at about the same time—"after a couple of thousand cycles." Then the laboratory subjected similar samples to a "simple treatment of surface peening, using little steel balls. . . . These pieces didn't break at 2,000,000 cycles."

Mr. Kettering explained that the experts do not know exactly what this peening does. "All we know," he said, "is that it is effective. We think we have now got the science of it worked out." In this remark, he doubtless was referring to the scientific studies of J. O. Almen in General Motors Research.

Eaton Mfg. Co. has been putting this peening on shot blasting process to practical use on leaf, torsion and helical springs. It extends fatigue life by a surprising margin, but it is not a cure-all. Shot blasting, according to Eaton experience, makes good steel better, but has little if any beneficial effect on poor steel. —p. 100

**NO EASY SOLUTION:** Members of the American Institute of Mining and Metallurgical Engineers attending its 160th meeting tackled the problem of postwar control of metals and metallic minerals and found it a hard nut to crack.

Some authorities argued for military sanctions as the only means of preserving peace among the nations. Others contended that such sanctions would excite international conflict. One speaker said "Don't touch them, unless you are ready to shoot."

Several alternatives to military sanctions were suggested. One speaker thought international cartels might work. Others warned against too much regulation or control. One cited the power of substitution of materials as "one of the great natural regulators."

The forum proved one point conclusively: There is no easy solution to the problem of international rivalry in metals. —p. 60

**FINE BLUEPRINT, BUT . . .** We have read the full text of the Baruch plan for demobilization twice. We find much in it to applaud and little to criticize. As a blueprint for a difficult job it is a masterpiece. It stresses the need of getting everybody to work on peacetime pursuits, of taking government out of business promptly, of terminating contracts cleanly and with dispatch and of disposing of surpluses in an orderly manner—all in a way that will give private enterprise a chance to function effectively. At the same time it gives due consideration to many human and social problems involved in the transition.

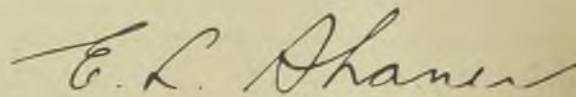
Nevertheless, the plan—good as it is—has been criticized sharply. This criticism, we suspect, is not because the plan is faulty but because the critics fear that it will be sabotaged by those who administer it. Unfortunately this fear is justified. The anti-business element of the executive branch is clever in interpreting laws and executive orders to suit its own subversive objectives.

If the nation can oust the palace guard and provide the Baruch plan with competent administration, then Mr. Baruch's optimistic picture of the postwar period would be plausible. —p. 57

**FITTING BY FREEZING:** For generations shopmen have relied upon two methods of fitting a collar to a shaft. One is to expand the collar by heating, slip it over the shaft and let the contraction in cooling effect a firm grip. The other is to force the shaft into the collar under heavy pressure.

These methods have served exceedingly well. It is hard to think of any important mechanical or structural assemblies in which shrink or force fits, or both, are not employed to advantage.

Now there is a possibility that a new method will gain wide acceptance. Improvements in refrigerating equipment have enabled industry to experiment with expansion fits—freezing shafts to contract them and then permitting them to expand into their collars. Preliminary work has indicated certain advantages in this method. In some instances a combination of freezing and heating can be employed effectively. Refrigeration has untested potentialities for industry. —p. 94



EDITOR-IN-CHIEF

# RYERSON STEEL RACES ACROSS COUNTRY



## 10 Tons of Sheets Delivered 700 Miles in 30 Hours 20 Minutes

It is 4:10 P.M.—a truck with ten tons of sheet steel pulls away from the Ryerson Chicago plant. In a Western war factory 700 miles away, important production for Army invasion equipment is waiting.

Flying the ODT "Emergency Flags" with special permission to travel at 60 miles an hour, the shipment arrives the next day at 11:30 P.M.—just 30 hours and 20 minutes after the order was dispatched.

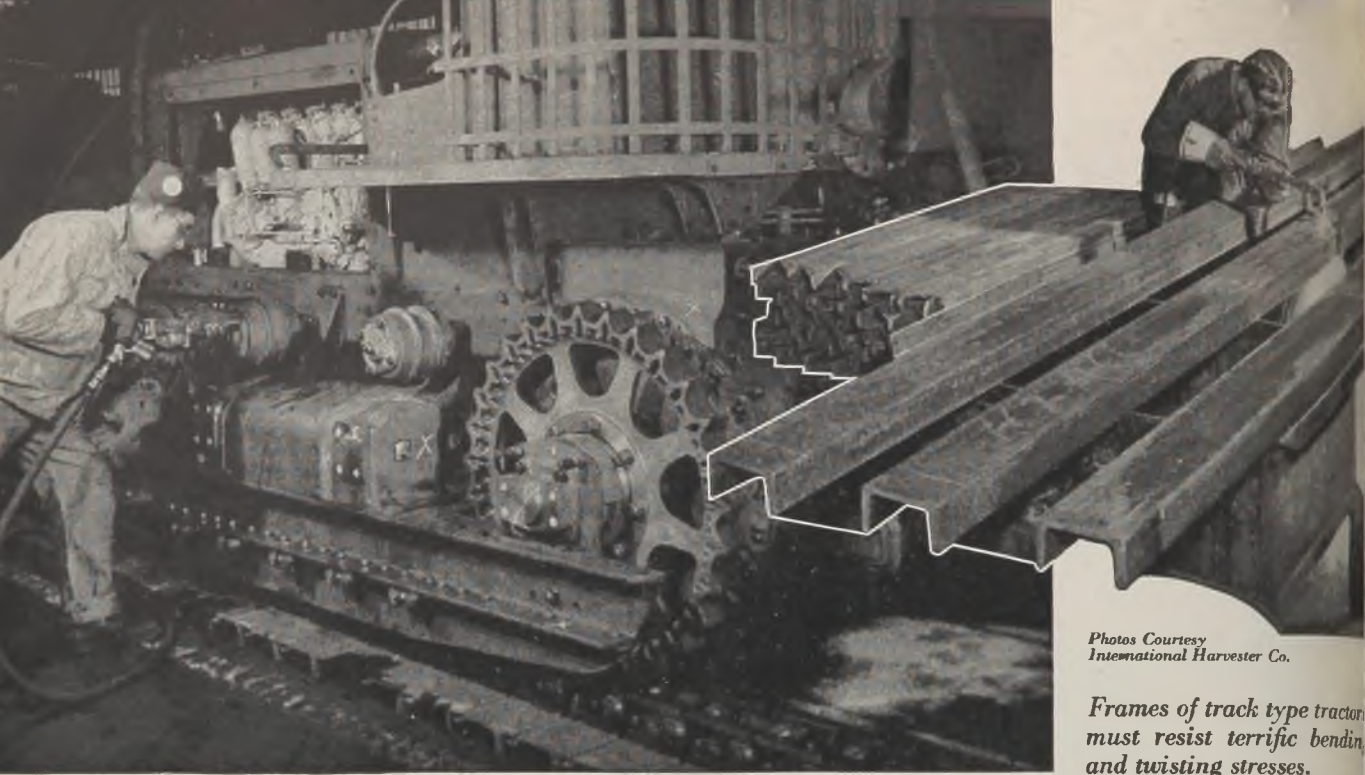
Two significant facts: The sheets so urgently needed were in Ryerson stock for immediate shipment. And Ryerson facilities and service measured up to the emergency.

Unusual? No! This order is only one of many Ryerson emergency shipments that are preventing production shut-downs in these critical times. Every day, Ryerson skill and experience are expediting deliveries of vital steel.

Next time you need steel in a hurry, whether it is sheets, plates, bars or beams—we urge you to call the nearest of the ten Ryerson Steel-Service plants. Whatever you require, you'll get prompt, effective cooperation.

Joseph T. Ryerson & Son, Inc., Steel-Service plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Philadelphia, Jersey City.

# RYERSON STEEL-SERVICE



*Photos Courtesy  
International Harvester Co.*

*Frames of track type tractors  
must resist terrific bending  
and twisting stresses.*

## Stronger Backbones for Tractors Using Inland Hi-Steel

Tractor frames must be strong—particularly those for track type tractors, which are turned by stopping one track, throwing terrific bending and twisting stresses onto the frame. That is why a manufacturer of tractors chose Inland Hi-Steel for the frames of their 10-ton track type Diesel tractors; Hi-Steel offers higher strength without added weight or size.

The original tractor design called for steel with 44,000 lb. per sq. in. yield strength. For the grueling service to which these tractors are subjected, especially when a bulldozer is mounted directly on the frame, it was found that greater strength was needed. Increasing the size of the frame section would have entailed complete redesign and sacrificing many desirable tractor features.

Inland Hi-Steel offered the perfect solution to the problem. Replacing the carbon steel

channels with Hi-Steel, which has a yield strength of 57,000 lb. per sq. in., made possible retaining the same size and weight of frame, while increasing strength 29.5%. All design features were retained, and adopting Hi-Steel called for no change in fabricating methods. Thousands of these sturdy, powerful tractors in service confirm the dependability of the Hi-Steel frames.

Inland Hi-Steel, the corrosion-resistant and high-strength, low alloy, has established records for service and endurance on many of the toughest peacetime and wartime jobs. Today, most of the Inland Hi-Steel goes into war jobs but when peace comes, it will again be available for the construction of equipment in which higher strength, reduced weight and greater corrosion resistance are factors in product design, sale and service.



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# Baruch Offers Pattern for Peace

*Jobs for all and getting government out of business primary aims in comprehensive postwar blueprint. Program similar to that recommended by Senator George's committee. Necessity for planning for reconversion now emphasized*

**J**OBS for all and taking the government out of business will be the Nos. 1 and 2 aims of the government's demobilization program, if the recommendations of Bernard M. Baruch and John Hancock, his assistant in the Office of War Mobilization, are followed.

Their report, a comprehensive document covering in considerable detail procedure and policies for the termination of contracts, disposal of surplus war property, and many other problems of the transition from war to peace, was submitted to the President through OWM Director James F. Byrnes.

In general, the program is similar to that recommended by the Senate Committee on Postwar Economic Policy and Planning. A major difference is that the Baruch plan depends more on executive directives than on law—a fact which caused some congressional criticism.

OWM Director Byrnes gave 100 per cent indorsement to the Baruch plan and last week started to implement it by making two key appointments recommended in the program.

To be surplus property administrator in the Office of War Mobilization, Mr. Byrnes appointed Will L. Clayton, as-

sistant secretary of commerce, and formerly a leading Texas cotton merchant.

To deal with the human side of demobilization—help returning service men obtain jobs, administer medical care, aid in resumption of education interrupted by the war, provide vocational training, and treat similar problems, he named Brig. Gen. Frank T. Hines, administrator of veterans' affairs. This will be the post to which the Baruch report gave the title of "work director" but which Mr. Byrnes changed to "director of retraining and re-employment in the OWM," to avoid the suggestion that the program would be a public works affair.

## "Easier To Convert for War"

Urging that demobilization plans be made now, Messrs. Baruch and Hancock stated it "is an easier task to convert from peace to war than from war to peace".

Expressing optimism over postwar prospects, they contend "there is no need for a postwar depression. Handled with competence, our adjustment, after the war is won, should be an adventure in prosperity."

Considerable emphasis is placed on the human side of demobilization. Listed

as the No. 1 consideration is "getting us all back to work in peacetime enterprises. This may require a special authority under the Director of War Mobilization to give its entire attention to the problem of bringing jobs to all workers, with emphasis laid upon the returning service men and service women who are our first concern."

Other considerations which the postwar planners found of primary importance are:

2. Taking the government out of business by payments for work done and under way, by moving war materials from plants to make room for resumption of civilian production, and by centralizing the control and disposal of surpluses in such a way as to bring them into ready and effective use and insure orderly markets. (Details on plans for settlement of canceled war contracts and disposal of surplus properties will be found on succeeding pages).

3. A general tightening up of the industrial war front "so as to finish the bloody business with finality, and thus be ready for peace."

4. Spreading acceptance of the uniform contract article.

5. Place all war agencies under running review to cut them down as their work dwindles; also review of all war industrial controls.

6. Immediate extension of laws governing price control, priorities and requisitioning.

7. Early engineering on public works

*Bernard Baruch, advisor to President Roosevelt, is shown as he discussed with newspaper correspondents in Washington his report on war and postwar adjustment policies which he submitted last week to James Byrnes, director, Office of War Mobilization. NEA photo*



to be ready if needed to fill in the valley of unemployment.

8. Provide credit means for those requiring it during the adjustment period, particularly for the smaller business groups and returning service men.

9. Prepare now for future action reducing taxes from war to peacetime levels, thereby providing necessary incentive for initiative and enterprise and stimulating employment.

10. Prepare an emergency "X" day reconversion plan to be used in the event of a sudden collapse of Germany so as to enable us to go on with our crusade against Japan and at the same time to prevent the dislocation resulting from lack of preparation. This phase of the broader plan is to be worked out by the armed services with the War Production Board.

"The frame of our operation shows the gigantic nature of the changeover. It affects every part of our economic life. Nothing comparable ever has been known before," Messrs. Baruch and Hancock declared.

"As one indication of the size of the job, about 50 billion dollars of the current annual production represents strictly war goods—that is, things, which when peace comes, we will stop making. This gap must be filled in large part by civilian production and services if we are to keep the needed volume of employment.

#### Demobilization To Be Gradual

"The demobilization of the armed forces will come gradually. Their absorption by industry will be aided by several factors, the weight of which is not now clear, such as: The giving up of war jobs by many women; the retirement of older workers; the increase in travel and recreation time; the return of many younger workers to school; the resumption of college or professional training by many now in the services; and renewal of many professional and service businesses that have stopped during the war; the starting of new enterprises; the business involved in meeting the needs of the world; reduction in the work-week; the normal enforcement of child labor laws."

The net increase in employment in industry from 1937 to 1944 is estimated at 7,600,000 people. Considering the factors mentioned, Messrs. Baruch and Hancock believe the problem of demobilization "though difficult, is soluble—if we create the atmosphere in which private initiative and resourcefulness—the traditional American spirit—can again take hold."

In the reconversion and readjustment will come "improvements in our standards of life—better houses, better clothes, better food, better safeguards for children, better health protection, and wider educational opportunities. These bring hope for the future instead of fear; they give security instead of unrest."

## Win Key Posts in Readjustment Program



BRIG. GEN. FRANK T. HINES



WILL L. CLAYTON

*General Hines, administrator of veterans' affairs, has been selected to administer the re-employment and the "human side of demobilization" in general. Mr. Clayton, formerly a leading Texas cotton merchant and more recently assistant secretary of commerce, will have charge of the disposal of surplus war property*

## Speedy Disposal of Surpluses Without Disrupting Trade Advised

*Plan proposes program be carried out under single administrator, with aid of policy board. Actual sales to be handled by four procurement agencies. Warns costs of plants to government no real yardstick of value to industry*

DISPOSAL of surplus government property as rapidly as possible without disrupting normal trade and industry is recommended by Baruch and Hancock.

To administer this policy, they propose the appointment of a surplus property administrator (Will L. Clayton, assistant secretary of commerce, has been appointed) in the OWM with full authority for handling every aspect of the surplus problem. The planners also recommended a surplus property policy board to be headed by the administrator and including representatives of the following agencies: War, Navy, Treasury, Reconstruction Finance Corp., Maritime Commission, War Production Board, Bureau of the Budget, the Food Administrator, the Attorney General, Federal Works Agency, State Department and Foreign Economic Administration.

Actual disposal would be handled through four major outlets, as follows: Consumer goods by the Treasury Procurement Division; capital and producer goods and all types of industrial property by a single corporation within the RFC; ships and maritime property by the Maritime Commission; food by the War Food administrator.

All of these agencies, as well as any other agencies called upon to handle special disposal problems, would follow the policies laid down by the administrator in consultation with the policy board. The surplus administrator would report to Congress as soon as possible on whatever legislation is needed.

Messrs. Baruch and Hancock offered their own suggestions as to the broad policies which the surplus administrator might follow. These include:

1. Sell as much as he can as early as he can without unduly disrupting normal trade.
2. Listen to the pressure groups, but act in the national interest.
3. No sales, no rentals to speculators; none to promoters.
4. Get fair market prices for the values with the proceeds of all sales going to reduce the national debt.
5. Sell as in a goldfish bowl, with records always open to public inspection.
6. As far as practicable, use the same regular channels of trade that private business would in disposing of the particular properties.
7. No government operation of sur-



plus war plants in competition with private industry.

8. No monopoly; equal access to surpluses for all businesses; preference to local ownership, but no subsidizing of one part of the country against another.

9. Scrap what must be scrapped but no deliberate scrapping of useful property.

10. Before selling surplus equipment abroad, assure America's own productive efficiency on which our high wages and high living standards rest.

The report recommends that the Army and Navy examine their inventories of the most critical civilian items to see what can be safely released during the war for the civilian economy without hurting the prosecution of the war.

The surplus administrator, the planners suggested, should study how to centralize the handling of real property and also explore the possibilities of beginning to liquidate government holdings.

Closest possible co-operation between the War Production Board and the surplus administrator should be effected so that controls do not unnecessarily hinder disposition by unduly limiting potential buyers, particularly in handling small quantities of surplus materials.

Surpluses would be offered in lots of such size as to permit businesses of all sizes to bid for them.

**Investment Totals \$15.5 Billions**

The report points out that the government's wartime investment in new plants and new machinery amounts to roughly \$15.5 billions. Between \$4 and \$5 billions are invested in plants especially designed for the manufacture of munitions, and most of these plants likely will be retained for future wars. Nearly \$1.5 billions is represented in improvements and expansions in arsenals and Navy yards which are operated by the government in war or peace. Less than \$10 billions of the government's investment has peacetime production possibilities. These include a little more than \$1 billion in so-called scrambled plants; about \$5.5 billion in industries which can produce for peace as readily as for war (steel, chemicals, gasoline, machine tools, electrical equipment, synthetic rubber and industrial components); lightly less than \$3 billion in plants that could be converted to peacetime production with some physical alterations (aircraft, aircraft engines, tanks, munitions, and assembly plants).

Size of the government-owned plants give rise to many difficulties in their disposition as 70 per cent cost more than \$10 million each and 12 per cent cost more than \$100 million each. Studies to determine the possibilities of subdividing the larger units were suggested.

The dollar cost of the government-owned plants constitute no real yardstick of their real value, the report states, since many of them were constructed at high war costs which bear no relation to their potential value in use by industry.

# Quick, Fair, Final Settlement of Canceled War Contracts Provided

*Complete "financial kit" proposed to speed termination. New type T loans to be offered to supply quick cash for manufacturers. Comptroller general's reviews would be limited to cases of fraud*

QUICK, fair and final settlement of canceled war orders through negotiation by contractors and procurement agencies with interim financing to bridge the gap between notice of termination and final settlement is the hub of the Baruch plan for terminating war contracts.

Foundation of the plan is the uniform termination article suggested by Messrs. Baruch and Hancock several weeks ago.

To assure quick cash pending settlement, the planners assembled a complete "financial kit" which includes the following:

1. Immediate payment—a full 100

per cent—for all completed articles.

2. On the uncompleted portion of the contract, immediate full payment of the government's estimate of "factual" items, where proof ordinarily is simple, such as direct labor or materials. On other items on which the government is able to satisfy itself, immediate payment up to 90 per cent of the manufacturer's total estimated costs.

3. Immediate payment in full of settlements with subcontractors as soon as approved.

4. Payment by the government of *(Please turn to Page 162)*

## Present, Past and Pending

**■ METAL POWDER ASSOCIATION FORMED**

PITTSBURGH—Formation of the Metal Powder Association was effected, at a recent meeting here. There will be four divisions of the organization as follows: Metallurgical powder, chemical powder, metallic paint pigment, and pyrotechnic powder. H. E. Hall is president, and offices are at 60 East Forty-second street, New York.

**■ WPB APPROVES PRODUCTION OF FLAT IRONS**

WASHINGTON—Domestic electric flat iron production for civilian use may be resumed on a limited basis where labor and war production do not preclude, the WPB announced last week.

**■ BATT URGES EXCHANGE OF GOODS FOR RAW MATERIALS**

NEW YORK—Adoption of a foreign trade policy of exchanging surplus manufactured goods for foreign metals, minerals, oils and other raw materials in order to replenish the nation's supplies was advocated by William L. Batt, vice chairman, War Production Board, in an address before the Bond Club here Feb. 24.

**■ CONSIDERS FREEZING EMPLOYEES IN JOBS**

BUFFALO—With workers leaving local war plants at the rate of 1500 monthly the area War Manpower Committee is considering the possibility of placing a "conditional moratorium" on workers which would freeze employes in jobs for a 90-day period.

**■ CREIGHTON RESIGNS WPB ALLOY STEEL POST**

WASHINGTON—L. E. Creighton, chief, WPB Alloy Steel Branch, has resigned, effective March 1, to return to his position as vice president of the Rotary Electric Steel Co., Detroit. He has been with WPB for the past year.

**■ BLAST FURNACE TAKEN OFF IN THE SOUTH**

BIRMINGHAM, ALA.—Tennessee Coal, Iron & Railroad Co. has taken off its blast furnace at Holt, Ala., for an indefinite period. The stack has been on ferromanganese, need for which is temporarily supplied. It will be maintained in stand-by condition.

**■ REPORT STACK CONSTRUCTION HALT ORDERED**

PITTSBURGH—Report circulating here is that the Defense Plant Corp. has ordered construction work halted on new blast furnaces being erected for the Pittsburgh Steel Co. and other producers. Confirmation of the report is lacking.

**■ NEW SILVER COATED WIRE IN PRODUCTION**

PATERSON, N. J.—Using a new silver coating process, Little Falls Alloys, Inc., this city, now is in production on spring grade beryllium copper wire.

# Mining and Metallurgical Engineers Differ on Extent Of Postwar Minerals Control

*Most authorities, speaking at New York convention, agree some restrictions will be necessary to prevent aggressor nations from rebuilding military machines, but express diverse opinions as to scope and nature*

POSTWAR control of metals and metallic minerals for the preservation of peace was generally approved by speakers at the 160th meeting of the American Institute of Mining and Metallurgical Engineers at the Waldorf Astoria, New York, Feb. 20-24. Considerable diversion of opinion as to the scope and nature of the control, however, was expressed.

At a special forum on the subject, C. K. Leith, War Production Board, and one of several speakers, said he personally believed sanctions should be applied to oil, steel and minerals going into the manufacture of steel, and certain of the lighter metals.

P. D. Wilson, also of WPB, commenting on aluminum and magnesium, called for rigid postwar supervision.

"Anything short of strict, direct military supervision would be ineffective and would result in such relaxation that another war would be inevitable,"

On the other hand, P. D. Merica, vice president, International Nickel Co., New York, thought minerals control alone would be relatively ineffective, and in this he was generally supported by G. C. Bateman, Department of Munitions and Supplies, Ottawa, and H. Foster Bain. Speaking with particular reference to military sanctions, he said they were not a measure of peace, but of war, and he warned: "Don't touch them, unless you are ready to shoot."

Dr. Bain believed some form of cartel operation might provide the necessary control, and in passing commented on the power of substitution, as "one of the great natural regulators".

In a paper he had prepared, but was unable to be present, having been called out of the city at the last minute, W. S. Tower, president, American Iron and Steel Institute, stated that co-operation of the Allies in the control of mineral and metal production in Axis countries may well influence the course of peace and postwar international economic stability.

While various economic phases and others of broad general character came up for discussion, much interest was focused on technical problems. Fifty-

eight sessions (eight more than last year) were devoted to these problems, with more than 240 papers presented.

Of special interest to iron and steel engineers were sessions devoted to impact and brittle fracture, properties of carbon and alloy steels metallography and hardenability, with a special symposium on the subject of continuous casting, sponsored by both the Iron and Steel and Institute of Metals divisions. A session was devoted to steelmaking and deoxidation, at which E. C. Wright, National Tube Co., Pittsburgh, discussed the manufacture and properties of killed bessemer steel.

The steel group also held symposiums on the determination of hydrogen, the theory of segregation, deoxidation of the open-hearth process and the segregation in steel.

## Two Sessions on Powder Metallurgy

The first annual conference of the institute on powder metallurgy was held under the auspices of the Metals division and comprised two sessions—one devoted to short discussions on production and design limitations and possibilities for powder metallurgy parts, and the other to formal technical papers. Physical metallurgy, manganese and manganese alloys, segregation in nonferrous alloys, and aluminum were among other subjects discussed by members of the Institute of Metals division.

The whole question of military sanctions came in for much discussion at the postwar mineral control session.

Dr. Leith believed that if controls are to be effective they must be under the supervision of an international body, technical in scope and including industrial, as well as governmental representatives. He stressed the importance of fact finding and up-to-date statistics. Much trouble after the last world war resulted from a lack of accurate information and proper control, he asserted.

Dr. Leith believed that sanctions could be worked out which would be entirely consistent with the aims of the Atlantic Charter, for he said aggressor nations were not, under its terms, promised mineral supplies on an equal basis with



CHESTER A. FULTON  
Southern Phosphate Corp., Baltimore,  
who has been elected new president of  
the American Institute of Mining and  
Metallurgical Engineers

other nations. He suggested, however, that controls should not interfere with the normal peacetime requirements of the Axis nations.

He also remarked that various steel men have indicated that control of materials at the source should be one measure of approach to the problem. Some believe, he said, that control of manganese, with close co-operation between this country, Great Britain and Russia, would be most effective. Control of scrap, however, would represent a more serious problem.

Mineral sanctions would not lead to Utopia; nevertheless, he saw no other alternative but to try it.

Mr. Merica was opposed to military sanctions as a dominating measure of control. In fact, as applied to the "normal" years, and not to the transition immediately following the war, and as applied primarily to metals and metallic minerals, he did not believe much in minerals control at all.

"I believe that minerals control alone is a relatively feeble means of preventing war or preparation for it, and it should therefore either not be used at all, or should be used only as one component of a more complete and effective plan for defense against aggression."

In normal years, he said, and except when confronted with the imminent threat of aggressive military action or with clear evidence of developing preparation for it, any mineral control program should be limited to the assembling of adequate statistical information concerning production, distribution and consumption of metals and metallic minerals. It might include also, he added, the organization of plans for the imposition of minerals sanctions whenever such drastic action was required.

Minerals control would require cumbersome control machinery and provoke international ill will, he declared. "W

must be most zealous not to restrict or interfere with the normal economic life of a nation until convinced of the imminence of intent and preparation for aggression and war. When so convinced, however, we must be prepared to apply promptly and in quick succession much more comprehensive, effective and harsher measures than those comprising merely that of minerals control."

Mr. Tower's paper pointed out that while the steel industry of this country has close to half the capacity of the entire world, its dependence on certain alloys, brought in largely from abroad, constituted a vulnerable point, which should receive important consideration in the formulation of a postwar policy.

"Modern steelmaking practice is based on the use of ferromanganese," he said. "Without imported supplies of manganese ore, our industry would not long continue to operate economically on any large scale. We do not control the sources of such supplies.

"Various special quality steels require vital percentages of alloying metals. For some of these metals, like nickel, chromium and tungsten, all, or some essential part of the necessary supply for our steel plants must come from foreign sources. Tin for coating belongs in the same category. Again we do not control the sources of such supplies.

#### Cites Aspects of Steel Industry

He cited two aspects of the iron and steel industry as they exist throughout the world which should be considered in connection with any postwar policy for this country in respect to control of metals. "First, shall the industries in enemy countries be restored or allowed to revive, to the former scale of operations? If not, how is restriction of steelmaking to be measured and applied? Large issues for economic relations and for the whole future of peace may hang on the answer.

"Second, are the industries in the Allied nations to co-operate in or to compete for, control of supplies of critical alloying materials? If co-operation is in the general interest, how is it best to be accomplished? The answers, in part, at least, are wrapped up in the politics of peace and in the tangled politics of raw materials."

The twenty-first Howe lecture was presented by James T. MacKenzie, chief metallurgist, American Cast Iron Pipe Co., Birmingham, Ala., on "Cast Iron—Steel Plus Graphite". The twenty-third Institute of Metals division annual lecture was delivered by W. W. Peirce, chief, Research division, New Jersey Zinc Co., on "Some Problems in Organizing Industrial Research".

Chester A. Fulton, president, Southern Phosphate Corp., Baltimore, was introduced as institute president for 1944, succeeding C. H. Mathewson, chairman, department of metallurgy, Yale University, New Haven, Conn. Also introduced were two new vice presidents: John Livermore Christie, metal-



C. D. KING

*Chairman of the operating committees, United States Steel Corp., and winner of the Robert W. Hunt medal for 1944*



LEONARD A. TOFFT

*General foreman of the new blast furnaces, Inland Steel Co., Chicago, and recipient of the J. E. Johnson Jr. award for 1944*

lurgist and manager, Handy & Harman, Bridgeport, Conn.; and J. Robert Van Pelt Jr., geologist and technical director, Museum of Sciences and Industry, Chicago.

New directors for 1944 are: Milton H. Fies, mechanical engineer and vice president in charge of the mining division, De Bardeleben Coal Co. Inc., Birmingham, Ala.; J. C. Kennear, mining and metallurgical engineer, and manager Nevada Mines division, Kennecott Copper Co., McGill, Nev.; Wallace E. Pratt, geologist, vice president, Standard Oil Co. of New Jersey, New York; John R. Suman, vice president, in charge of production, Humble Oil & Refining Co., Houston, Tex.; Robert W. Thomas, general manager, New Consolidated Copper Corp., Ray, Ariz., and Andrew Fletcher, vice president, St. Joseph Lead Co., who succeeds the late H. T. Hamilton, assistant to the president, New York Trust Co., New York,

not only as a new director, but as treasurer of the institute.

William A. Haven, vice president, Arthur G. McKee & Co., Cleveland, was elected chairman, Iron and Steel division, and Arthur Phillips, professor of metallurgy, Yale University, chairman, Institute of Metals division.

The annual Medals and Honors dinner was held at the Waldorf-Astoria Wednesday night, with Cornelius F. Kelley, chairman, Anaconda Copper Mining Co., the principal speaker and with C. H. Mathewson, retiring institute president, presiding.

Mr. Kelley was awarded the Charles F. Rand Memorial Medal for "conspicuous success as administrative head of great enterprises engaged in the production of nonferrous metals at home and abroad."

#### Awarded Medals for Papers

The Robert W. Hunt medal for 1944 went to Clarence David King, chairman of operating committees, United States Steel Corp., for his paper entitled, "The Washing of Pittsburgh Coking Coals and Results Obtained on Blast Furnaces," while the J. E. Johnson Jr. Medal was awarded Leonard A. Tofft, general foreman of the new blast furnaces of Inland Steel Co., Chicago, for this work as outlined in his paper, "Correcting Improper Flow of Gas Through a Blast Furnace."

George B. Harrington, president, Chicago, Wilmington & Franklin Coal Co., Chicago, was awarded the William Lawrence Saunders medal for "Distinguished Achievement in Mining Coal." The Anthony F. Lucas medal went to Charles Van Ormer Millikan, chief engineer, Amerada Petroleum Corp., New York, for his "outstanding contribution in the development and production of petroleum."

The Institute of Metals dinner was featured by an address by the new institute president, Mr. Fulton, who spoke on "Bones." Also, upon this occasion, the Institute of Metals division award for 1944 was presented to authors of a paper entitled, "Aging in the Solid Solution of Silver in Aluminum." The authors were Alfred H. Geisler, research metallurgist, Aluminum Research Laboratories, New Kensington, Pa.; C. S. Barrett, associate professor of metallurgy and member of the staff of the metals research laboratory, Carnegie Institute of Technology, Pittsburgh; and Robert F. Mehl, director of the metals research laboratory and head of the department of metallurgy, Carnegie Institute of Technology.

Edward Steidle, dean, School of Mineral Industries of Pennsylvania State College, told engineers at a meeting of of Mineral Industry Education division that the United States was "paying a high price in mineral depletion" for the privilege of being the arsenal of democracy.

Attendance at the sessions was estimated at 2600.

# Stocks May Top 10 Million Tons By End of Year

*Contract cancellations emphasize redistribution problem. Prompt and maximum utilization in war and essential civilian goods sought*

CANCELLATION of more than 15,000 ordnance contracts since Pearl Harbor, with prospects of further substantial readjustments in war material programs soon, re-emphasizes the growing problem of prompt redistribution of idle steel stocks resulting from contract cancellations and cutbacks.

Scheduled deliveries to the Army in 1944 are only slightly less than last year, but the emphasis has been shifted to procurement for replacement purposes and the carrying out of new programs resulting from the redesigning and development of new equipment to meet expanding war effort in the Pacific area and from experience gained in other areas.

On Dec. 31, last, 4200 of the 15,000 canceled ordnance contracts remained unsettled, indicating the problem of terminating contracts and the redistribution of inventories and equipment is not just a problem for the future; to a large extent it is with us now.

Key to the solution of surplus inventories is prompt and maximum utilization of the items by both war and essential civilian industries. Extremely sensitive timing in the transition from war to easing of restrictions on output of essential civilian goods output is necessary if the redistribution program is not to be impeded.

Estimates of overall tonnage of excess steel inventories vary widely, ranging from 1.5 million tons to double this figure, and by the end of the war likely will top 10 million tons. Most of this tonnage will be used in regular civilian goods production after the war, while some can be exported. A high percentage of this material will have to be scrapped, for a large proportion of items are strictly military in character and cannot conceivably be adapted for civilian use.

Accurate data as to the amount of excess steel inventories are unavailable for the reason considerable tonnage is constantly being channeled back into production and additional items made available almost daily. Further, the tonnage reported through the WPB Surplus Steel branch represents only a portion of the steel available, for the Ordnance department, Navy and both air corps handle direct the rechanneling of most of the ex-



**READY FOR ACTION:** Hundreds of invasion barges, which await shipment to global theatres of action, are shown stored at Albany, Calif. This was formerly a race track but now is a naval landing force equipment depot which was crowded with invasion barges 16 days after conversion work began. NEA photo

cess steel resulting from the cancellation or cutbacks of their contracts.

Some observers believe lists of surplus steel should be expertly appraised and the noncommercial items speedily scrapped. The movement of inconsequential items may be accelerated by selling them locally with a minimum of restrictions as to price and application. Commercial sizes, qualities and quantities are the only ones that should be offered generally to industrial buyers. A high percentage, 35-40 per cent, of such items now are being delivered to export markets.

### Price Incentives Necessary

Government officials handling the redistribution of idle steel stocks recognize these inventories must compete with new mill production. Many feel that price incentives are necessary if buyers are to be interested. However, the price advantages which may be made available on surplus steel items should not be great enough to stimulate speculative buying.

It is impractical for many general steel warehouses to handle a great many tons of only a few items, their establishments being designed for inventories of relatively small quantities of the many sizes and kinds of steel mill products commonly required by their customers.

Most practical solution appears to be prompt utilization of excess stocks in the current war program. If military applications cannot be developed, then, the steel should be used for the production of badly needed civilian articles. Resumption of production of civilian goods, however, involves questions of manpower availability and competitive relationships between those who may be permitted to

produce items for civilian use and those who, for one reason or another, are prohibited from resuming consumer operations.

Only a few instances have so far been noted in which the sale of idle steel stocks has affected the normal warehouse distribution of steel. However, if the movement reaches substantially larger proportions than at present, with perhaps the major portion at below established warehouse price levels, steel distributors' prices may be adversely affected. With anyone now able to establish themselves as dealers and permitted to buy these excess steel inventories at reduced prices, the task of maintaining distributors' price levels may become difficult. Majority of the excess stocks currently available, however, are not distributed through warehouses.

Considerable confusion exists as to limitations on the selling of excess steel stocks by dealers and brokers. No priority is necessary to purchase these items, but unless the material is put through the process known as warehousing they are restricted to the mill price ceilings, and sales must be governed by all regulations under the War Production Board's Controlled Materials Plan.

Indicative of the sharp increase of excess steel inventories rechanneled into the war effort by various procurement agencies in recent months, is the report of the Cleveland Ordnance office. Idle steel redistributed by this office during the last half of 1943, for the 22-county area covering northern Ohio and part of Pennsylvania, more than tripled the 3500 tons of steel redistributed in the first six months. Currently more steel is accumulating than being rechanneled into war production.

# Tough Collection Job Confronted With Many Sources Restricted

*Intensive effort held needed to meet 1944 purchased scrap goal of 24.5 million tons. Overall stock position favorable currently but situation is unbalanced with respect to grades. Easier price tone noted in some directions*

PURCHASED scrap collection goal of 24.5 million net tons for this year is two million tons smaller than that of 1943, but the job ahead is expected to be tougher, requiring more intensive planning and ingenuity than last year.

Overall stocks currently compare with those of a year ago but there is a serious unbalanced situation in the proportion of heavy melting steel and broken cast grades in relation to total inventories. In addition movement of scrap from industrial plants into consuming channels has been declining lately, while much of the dormant industrial and home scrap has been largely collected.

Based on estimated 1944 purchased steel scrap requirements of 24.5 million net tons, the WPB Salvage Division has established quotas for the first six months this year for each state in accordance with their average monthly percentage of the national shipments during a 15 month period.

Average monthly shipments for the past 15 months for the nation totaled 2,146,188 net tons, while the monthly collection quota for the first half this year on a nationwide basis has been established at 2,041,667 tons.

Of the 24.5 million tons 1944 collection goal, two million tons are expected to come from private homes, 2.3 million tons of alloy grades from industrial plants, 700,000 tons from auto graveyards and the remainder of 19.5 million tons from general plant production scrap collections and special projects.

The WPB General Salvage branch is planning to put added emphasis on drives for scrap in rural areas, but only in those counties where known large quantities exist.

Total 1944 requirements are expected to be only moderately below the 1943 consumption of about 55.5 million gross tons.

Recently signs have been developing of an easing in scrap prices. Alloy grades, low phos, and turnings and borings have been selling under OPA ceiling prices for some time. A number of consumers in the recent past have refused to pay price differentials allowed in some instances on shipments from outside their area.

Turnings from the Cleveland area are finding their way into the Pittsburgh district at ceiling prices. This indicates that surpluses of turnings are accumulating at Cleveland. One mill in the area recently had a railroad embargo placed upon it because of its inability to

clear its siding of the scrap laden cars.

Slower movement of scrap to consumers has affected scrap prices in another manner. Dealers, claiming not to have a ready market for many items, have not pushed collection efforts with the result production scrap has been accumulating at some points. Under such conditions dealers have been able to purchase this material from 50 cents to as much as \$3 a ton below former price levels.

Some sales of heavy melting steel at Detroit have been made recently at \$17.00 per ton, off 85 cents from former levels.

### No Downward Price Revision

These developments in the scrap market, however, do not necessarily imply an impending downward price revision on all grades, for as long as the war lasts there is not expected to develop much relief from the present shortages of heavy melting steel and broken cast items.

Dealers also state insufficient yard labor has had adverse effect on their

collection efforts. However, they have experienced exceptionally open weather so far this winter which has materially aided collections and processing efforts.

Indicative of the spotty situation in scrap supplies in respect to certain grades, is the report allocations by the Maritime Commission from the West Coast to mid-western and eastern mills will amount to about 70,000 tons.

To ease the cast scrap supply situation, OPA has increased dealer's fee for preparing heavy breakable cast grades into foundry sizes to \$3.50 from \$2.50 per gross ton. This was accomplished by reducing the prices of unprepared material by \$1 a ton.

Substantial improvement in the pig iron supply, resulting in an increasing proportion of iron in the open hearth mix, is also a factor. Reduced requirements for alloy scrap grades has been noted for some time now with no indication of a reversal of this trend.

A breakdown of the total iron and steel scrap inventory figures on the basis of available supplies for specific purposes is necessary to accurately appraise the supply situation, Herman Moskowitz, technical advisor on iron and steel scrap, WPB, stated recently in a report to salvage division directors.

The nation's open-hearth furnaces require nearly 70 per cent of all the scrap used, yet only 51 per cent of the present scrap inventory is suitable for such use, the report states.

"This indicates that unless we maintain intensive salvage campaigns to continue the flow of scrap the monthly loss

## WPB's Iron and Steel Scrap Quotas by States

JANUARY 1 TO JUNE 30, 1944

(Net Tons)

<b>Region I</b> .....	<b>780,325</b>	<b>Region VII</b> .....	<b>490,000</b>
Maine .....	74,725	Missouri .....	270,725
New Hampshire .....	14,700	Arkansas .....	35,525
Vermont .....	20,825	Kansas .....	104,125
Massachusetts .....	320,950	Nebraska .....	79,625
Connecticut .....	280,525	<b>Region VIII</b> .....	<b>504,700</b>
Rhode Island .....	68,900	Louisiana .....	96,775
<b>Region II</b> .....	<b>1,392,825</b>	Texas .....	313,600
New York .....	839,125	Oklahoma .....	94,325
New Jersey .....	553,700	<b>Region IX</b> .....	<b>132,300</b>
<b>Region III</b> .....	<b>1,140,475</b>	Wyoming .....	40,425
Pennsylvania (East) .....	759,500	Colorado .....	53,900
Maryland .....	205,800	New Mexico .....	13,475
Delaware .....	24,500	Utah .....	24,500
Virginia .....	133,525	<b>Region X</b> .....	<b>649,250</b>
District of Columbia .....	17,150	California .....	612,500
<b>Region IV</b> .....	<b>726,425</b>	Nevada .....	3,675
North Carolina .....	96,775	Arizona .....	9,800
South Carolina .....	69,825	Idaho .....	23,275
Georgia .....	122,500	<b>Region XI</b> .....	<b>1,040,025</b>
Florida .....	58,800	Michigan .....	1,040,025
Alabama .....	171,500	<b>Region XII</b> .....	<b>417,725</b>
Mississippi .....	36,750	Minnesota .....	369,950
Tennessee .....	170,275	Montana .....	14,700
<b>Region V</b> .....	<b>2,677,850</b>	North Dakota .....	14,700
Ohio .....	1,467,550	South Dakota .....	18,375
Kentucky .....	193,550	<b>Region XIII</b> .....	<b>198,450</b>
West Virginia .....	154,350	Oregon .....	93,100
Pennsylvania (West) .....	862,400	Washington .....	105,350
<b>Region VI</b> .....	<b>2,099,650</b>	<b>United States total</b> .....	<b>12,250,000</b>
Indiana .....	524,300		
Illinois .....	1,025,325		
Iowa .....	122,500		
Wisconsin .....	427,525		

in inventory which has been relatively small thus far but definitely downward for the past year, will from now on show an even greater decline, particularly in the needed grades," said Mr. Moskowitz.

"I agree with John T. Whiting, director of the Steel Division, WPB, when he told all regional salvage managers that there will be a home for all carbon scrap that can be generated and that the same amount of generative effort will be necessary in 1944 as in 1943, especially in view of the fact that the easy scrap already has been moved and that the potential supply is not as great or as convenient to move. Up until the time when victory is near there will continue to be a definite shortage of heavy melting scrap."

An increasing tonnage of battlefield scrap is being sent to mills in England.

## Upturn in Scrap Stocks Reflect Strikes, Holiday

Iron and steel scrap stocks at plants of consumers, suppliers and producers at the end of December totaled about 6,458,000 gross tons, or a gain of 1 per cent over the 6,391,000 tons recorded Nov. 30, 1943, Bureau of Mines reports.

This was the first gain in stocks since June of last year, and was principally accounted for by an increase of about 26,000 tons in dealers' yards, and 24,000 tons of home scrap at consumers' plants.

The average daily melt of purchased scrap, home scrap and pig iron declined 8, 6, and 3 per cent respectively during December. Total consumption was off 1 per cent to 8,930,000 gross tons.

# Revise Gray Iron Casting Price Order

*More stable price structure should be provided by six changes in provisions of OPA regulation No. 244—Revision is designed to strengthen and clarify the ceilings and aid in enforcement*

SIX CHANGES in the provisions governing maximum prices for gray iron castings, designed to strengthen and clarify the ceilings and aid in their enforcement, were announced by the Office of Price Administration last week.

The net effect of the changes, OPA said, should be to provide a more stable price structure in the gray iron castings field. The changes are as follows:

1—Sellers of gray iron castings using the "base period" method of computing maximum prices, beginning March 1, 1944, are authorized to add overtime labor costs in calculating ceilings. This may result in an increase of 2 to 3 per cent in the level of maximum prices for gray iron castings. It will, however, tend to stabilize prices, for previously producers were authorized to add overtime labor costs in computing maximum prices only under the "formula" and "pre-base" period pricing methods.

2—In computing ceiling prices for "short orders" (orders where the shipping weight of the casting multiplied by the quantity ordered does not exceed 200 pounds) the maximum price must be determined by multiplying the shipping weight of the casting by twice the seller's average price per pound for gray iron castings in 1942 and by adding a starting charge of \$8 for noncored or \$12

for cored castings. Previously "short orders" had to be priced in the same manner as any other orders for castings.

3—Sellers of castings under the "formula" method hereafter are permitted to recompute ceiling prices only once on any casting sold under that method.

4—In a revision of pricing provisions, any seller of gray iron castings who delivered a casting during the base pricing period Aug. 1, 1941, to Feb. 1, 1942, now must use the "base period" method of establishing ceiling price for that casting.

5—Sellers of castings under the "pre-base" pricing method, once they have chosen to use this method to price castings 30 days after the effective date of the amendment, may not shift over to the "formula" method of pricing.

6—Scope of the "base period" method of computing maximum prices now is narrowed, with the result that more castings will be priced by the "formula" method. This is accomplished by providing that in order that a casting may be priced by the "base period" method, the identical casting must have been sold or offered for sale by the seller in the base period. If substantially the same casting was sold or offered for sale in the base period, a maximum price is thereby established only if it was sold or offered for sale to the purchaser to whom the casting is presently being priced.



**GIANT:** This corrugated one-piece ingot mold, weighing 400,000 pounds, was cast by the Bethlehem Steel Co.'s iron foundry. It measures 111 x 199 x 164 inches on the outside, 66 x 154 x 165 inches on the inside, and the weight of the core was approximately 100,000 pounds. Pouring was done on Jan. 15 from two large 150-ton submarine ladles and two regular 15-ton ladles. About 500,000 pounds of hot metal were used. With the hoisting rig, the mold represented a crane lift of 220 tons

## Tungsten and Molybdenum Product Order Clarified

Under terms of the latest amendment to order M-369, each person seeking to acquire tungsten, molybdenum and their alloys in the form of wire, roll or sheet as a part of powder metallurgy must make written application to the War Production Board not later than the "first day of the second month preceding the month in which delivery is desired." As reported in STEEL, Feb. 21 issue, it was not made clear that tungsten and molybdenum products used by the steel industry were removed from allocation Dec. 30, 1943.

## Foundry Equipment Sales Index Lower in January

Foundry Equipment Manufacturers' association, Cleveland, reports index of net orders closed on new equipment in January was 321.6, compared with 396.5 in December; 328 in November.

Total sales index was 378.3 in January, 442.8 in December and 388.0 in November.

## POSTWAR PREVIEWS

**DEMobilIZATION**—Blueprint for transition from war to peace, offered by Bernard M. Baruch and John Hancock, emphasizes need for jobs for all and getting the government out of business. Presents detailed plans for disposing of surplus war property and for quick, fair and final settlement of contracts. Resembles program of Congress, but depends more on executive directives than law. See page 57.

**METALS CONTROL**—Mining and metallurgical engineers agree some control of metals and mineral resources will be necessary after the war to prevent aggressor nations from rebuilding military industries, but differ on nature and scope of sanctions. See page 60.

**STOCKPILING**—Plans for purchase of a \$5 billion stockpile of raw materials, sufficient to carry the country through three years of any third world war, are being ironed out in Washington. Support for the plan is said to be general. See page 66.

**SYNTHETIC FUEL**—Bureau of Mines forges ahead in program to construct pilot plants for production of synthetic liquid fuels from coal, lignite, oil shale and "other substances" as insurance against petroleum depletion. See page 68.

**BUSINESS EXPANSION**—Commerce Department estimates American business will have between \$10 and \$20 billions for postwar expansion of facilities, after allowing for reconversion costs, replenishment of civilian goods inventories, purchase of equipment, re-extension of consumer credit and deferred maintenance. See page 69.

**COLLABORATION**—Business, labor, farm and civic leaders agree cooperation among formerly conflicting interests will be necessary for postwar prosperity. See page 69.

**TOMORROW'S DESIGNS**—Building up expectations of "dream" planes, cars and appliances immediately after the war in the minds of potential customers may hamper efforts of sales forces. Engineering, production and cost problems will delay achievement of miracle designs. See pages 73, 76.

**BONDING ALUMINUM, STEEL**—Process which chemically bonds pure aluminum to steel, developed by aviation industry, holds large implications for automotive and appliance industries and others where efficient heat transmission or strength and lightness are required. See page 78.

**MACHINE TOOL STEEL**—Techniques of selection and use of alloy steel in machine tool industry likely to be altered permanently in favor of many National Emergency steels by their service record in machine parts. See page 92.

**SHRINK-FITTED PARTS**—New developments in chilling methods and equipment afford maximum of 140 degrees Fahr. below zero temperature in preparing parts for assembly with shrink or expansion fits. Latest achievements may have great bearing on future production-line setups. See page 94.

**STORAGE-BATTERY WELDING**—First practical direct-current resistance welding system is controlled by new carbon pile "interruptor", uses storage batteries as power source. Will extend benefits of this joining method to localities lacking requisite power facilities for other resistance welding machines. See page 104.

**FLYING DIESELS**—Commercial airliners that will burn furnace oil costing only 6 cents a gallon are foreseen by Gordon Lefebvre, president of Cooper-Bessemer Corp. He predicts that within five years all commercial aircraft engines will be diesels.

**EMPLOYMENT PROSPECTS**—Janesville, Wis., which has completed a company-by-company survey of industrial employment after the war, foresees 8 per cent more jobs when war orders cease than during the peak of war production.

## OPA Cost Study On Carbon Steel Nearly Finished

*Tabulations are expected to be completed around March 1. Alloy study may take two or three weeks longer*

CARBON steel cost study which is being made by OPA should be completed about the first of March, officials say. No one is inclined to guess as to when the alloy survey will be completed.

Tabulations are nearing completion on the carbon study and it is considered possible that the OPA Steel Advisory Committee will meet in Washington when the figures have all been tabulated. No decision on this has been made yet.

Cost study on the alloy study will be under way in the next ten days or so and it is considered likely that this work will take two or three weeks to complete.

## House Overrides Tax Bill Veto 299 to 95

Conflict between the national administration and Congress, brewing for some time past, came to a head last week with the House on Thursday overriding the President's veto on the \$2,315,200,000 tax bill, and similar action by the Senate believed certain.

The House vote overriding the veto—299 to 95—followed the resignation of Senator Barkley, Democratic leader of the Senate, in protest to implications in the President's message vetoing the tax bill. Senator Barkley was immediately re-elected leader by a conference of Democratic senators.

Overriding of the veto by the Senate would immediately put the tax bill as passed by Congress into effect.

## EARNINGS . . .

Net profit for 1943 of \$12,011,057, reported by Republic Steel Corp., Cleveland, is equal to \$1.77 a common share, and compares with \$2.67 a share, or \$17,154,578 earned in the preceding year.

\* \* \*

Allegheny Ludlum Steel Corp., Pittsburgh, reports 1943 net profit of \$3,865,315, equal to \$2.91 per common share.

\* \* \*

For the fiscal year ended Oct. 9, 1943, Lukens Steel Co., Coatesville, Pa. had net income of \$1,317,281, equal to \$4.14 a common share, compared with \$1,172,522, or \$3.68 a share in the preceding fiscal year.

## Congress Gets Dinner Bid

SOMETHING new appeared on the capital scene when all members of Congress received invitations on Feb. 18 to attend a dinner party to be held in the ballroom of the Mayflower hotel, Washington, Tuesday evening, Feb. 29, by Jack & Heintz Inc., Cleveland. "That the senators and representatives of the United States may have a better understanding as to what the company of Jack & Heintz Inc. is doing in the way of production for the war effort, how we are doing it, and what we stand for in helping to make this a better America to live in," wrote William S. Jack, company president.

After the dinner, said the invitation, the senators and representatives will be shown the products the company manufactures and a motion picture of its plant operations, after which Mr. Jack will answer questions.

## "Ducks" Prove Their Worth

On the basis of battle achievement, the Army Ordnance Department is stepping up production of amphibious trucks known as "ducks." These are provided with six wheels for operation on land and with a rear-mounted propeller for operation in water. They pick up battle supplies from a transport or LST (landing ship, tank) and bring them to inland ammunition dumps. At Salerno a large fleet of ducks was loaded and placed in the water 12 miles from shore at 2 a. m., and in the darkness slipped in unobserved by the enemy. They again have proved their value in the Nettuno invasion below Rome.

## Small Business Gets Share

Almost 75 per cent of its prime contracts during 1943 went to "small" business, companies employing fewer than 500 persons, the Army Quartermaster Corps announces. Nearly half of the total prime contracts went to companies employing fewer than 100 persons. Its purchases in 1943 came to \$4,205,645,717.

## Assails Bureaucrats

Bureaucrats who have been assailing the attitude of Congress in regard to inflation had better examine their own personal situation first, said Rep. Frank B. Keefe (Rep., Wis.), in a recent speech. When Judge Vinson was appointed Economic Stabilizer, he pointed out, Mr. Vinson's salary was increased from \$12,500 to \$15,000 and on top of that he receives a cost-of-living bonus of \$628.32 a year. When Chester Bowles was OPA state administrator in Connecticut, Mr. Keefe said, he received \$7138.32 per year; now he is paid \$12,000 plus \$628.32 cost-of-living bonus. He cited the effect of Public Law 49 in increasing compensation of some 3,000,000 government em-

ployes anywhere from 15 to 21.6 per cent. "Judge Vinson," said Mr. Keefe, "has been telling the country that an 8-cent-per-hour increase in the wages of railroad laboring men who earned an average of about 57 cents an hour in 1942 would cause inflation. The point I want to make is—what do you conceive the morale of the railroad workers must be

## STOCKPILING

Government officials are ironing out a long-term program for the purchase of \$5 billion stockpile of raw materials to carry through three years of any third world war. The general idea is said to have almost unanimous support.

The program is expected to aim at:

First, the freezing of all surplus war materials on hand at the close of this war, start the stockpiles and, for the benefit of the mining industry, prevent dumping.

Second, it would hold these stockpiles—iron, manganese, tin, tungsten, lead, zinc, copper, rubber, phenol, etc.—inviolable until Congress voted that there was no "national emergency" and the materials could be released.

Third, these stockpiles are now considered the "first line of defense", although not obviating the program for a larger regular army, and a two-ocean navy.

Fourth, it is hoped that the knowledge, abroad, that the U. S. maintains these huge stockpiles in connection with her fantastic production ability, will forever stop any other nation from going to war.

when they learn that their demand for an 8-cent-per-hour increase was denied by an economic stabilizer who had just received a yearly increase of \$3128.32?"

## Bit of Levity

Occasionally the serious business of the Senate is relieved by a touch of levity. This happened when that body voted to legalize "dry milk solids" as the name for the product that formerly bore the humble name of "skim milk". Sen. John H. Overton (Dem., La.) took advantage of the occasion to introduce an amendment, speedily defeated, proposing that oleomargarine be renamed "vegetable butter", spinach hereafter be identified as "health and strength greens", and castor oil known either as "elixir of life" or "nectar of the gods"—whichever the Senate preferred. Senator Overton apparently was retaliating for the blunt refusal of northern senators last January to accede to the southern demand for elimination of prohibitive taxes on colored oleomargarine.

## Seek Steel for Shelving

The newly organized WPB Locker and Shelving Industry Advisory Committee, one of four committees that replace the old Metal Office Furniture Industry Advisory Committee, has gone on record unanimously that wood shelving which the group now is supplying for essential industrial and military needs, is not satisfactory to the purchasers, while being at the same time more expensive than metal. They asked for a steel allocation, to be made as soon as feasible, to be used in making essential and military shelving and were told that their request would receive early consideration. Owing to declining orders for the war program, the group felt it would be possible to resume production for civilian use during the next 90 days without disturbing manpower conditions even in critical areas.

## Tentative Program

While the working schedules of the United Nations' Relief and Rehabilitation Administration still are not set because of uncertainty as to the requirements that will be revealed after the occupied European countries are set free, the UNRRA program as it stands at this time provides that "raw materials, machinery and spare parts" will be furnished to transport relief supplies elsewhere, to rehabilitate "public utilities and services, insofar as they can be repaired to meet such immediate needs as light and water, power, transportation and communication," and to set going "relief industries such as those providing food, clothing, shelter and medical supplies."

## Postwar Aim

The House Roads Committee will start hearings Feb. 29 on H. R. 2426 which calls for federal aid of \$1,000,000,000 a year for three years after the end of the war in construction and improvement of highways and bridges throughout the country. The program, broadened vastly by the amount of work to be done with state, county and municipal funds, is aimed at providing a large amount of employment in the immediate postwar era, not only on roads and bridges, but at plants manufacturing various kinds of materials and equipment.

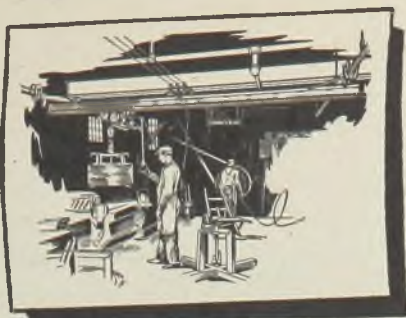
## On the Increase

Labor-management committees American war plants now number more than 4000, according to T. K. Quinn, director-general of the WPB war production drive. This compares with 2000 such committees six months ago. The trend is increasing rapidly; more than 100 such production groups were registered in the week ended Feb. 19; additional registrations are being received daily.





Hand Crane  
with Connecting Tracks



Stripper Crane  
with Electric Hoist.



Spur Tracks Switch  
through Ovens.

# Ideas for Post-War PRODUCTION

Here are several American MonoRail installations which have proven successful in low cost handling. Any plans for postwar production should include such handling methods.

Regardless of the size or type of application, American MonoRail Engineers can help. Their specialized experience often uncovers hidden possibilities for simple systems that bring immediate returns. Consultation with these men is available without obligation. Write for copy of Bulletin C-1 showing a wide range of installations.

## THE AMERICAN MONORAIL CO.

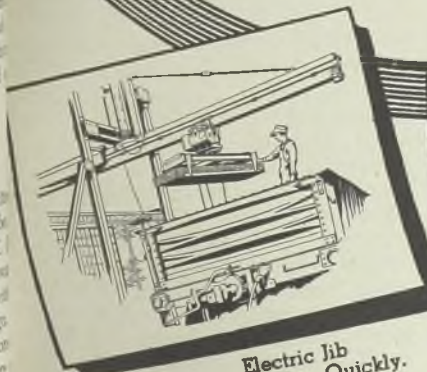
13102 ATHENS AVENUE • CLEVELAND 7, OHIO



One Unit Charges  
Two Cupolas.



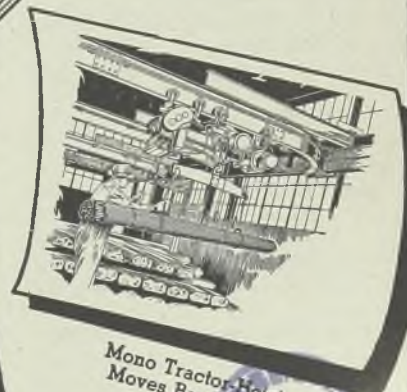
Special Crane  
for Fast Quench.



Electric Jib  
Unloads Cars Quickly.



Rigid Arm Makes  
Handling Easy.



Mono Tractor-Hoist  
Moves Bar Stock.

POLITECHNIKI

# Co-operative Achievements Held Not Patentable in Court Decision

*Judge Thurman Arnold of U. S. Appeals Court upholds Patent Office in Teletype Corp. automatic stock quotation board case. Takes position patent system is intended to protect individual inventors, not corporations*

IN ANOTHER important patent decision, Judge Thurman W. Arnold of the United States Court of Appeals holds the purpose of the constitution is not served "by a construction of law that gives to a dominating group the power to control the co-operative achievements of large groups of scientists."

Judge Arnold gave voice to this principle in a decision upholding the refusal of the Patent Office to grant a patent to "Louis M. Potts and the Teletype Corp." covering an automatic stock quotation board for use in stock brokers' offices.

It is operated from a central station, over a single wire, using the equal length electrical impulses familiar in telegraphy. Its novelty consists of elaborate mechanisms for selecting these impulses so that they will produce the proper letters and figures on the board. In rejecting the claims for a patent, the Patent Office held that they represented simply a combination of ideas disclosed in former patents and that the improvements which had been added to make the design commercially profitable required a high degree of skill in the art of communications, but not invention.

In his decision, Judge Arnold takes the position that the American patent system is intended to protect individual inventors, not corporations.

"The appellant Potts, who claims to be the inventor," reads the decision, "is an employe of the Teletype Corp. and has assigned his patent rights to that corporation. Public records disclose that the Teletype Corp. is a wholly-owned subsidiary of Western Electric. Western Electric, in turn, is a manufacturing subsidiary owned and controlled by the American Telephone & Telegraph Co."

Through its subsidiaries, Judge Arnold continues, the American Telephone & Telegraph Co. controls between 80 and 90 per cent of local telephone service and 98 per cent of the long distance telephone wires of the United States. Through its patents on teletypewriter machines "it dominates a service which to a large extent has supplanted ordinary telegraph service. News telephoto service is dependent on Bell plants. Telephone service across the ocean is a monopoly with the Bell system.

"It manufactures more than 90 per cent of the telephone equipment in the United States. It owns and controls a large number of patents not only for instruments used in communications but also in the electrical arts, including radio transmitting and receiving equipment, therapeutic

devices, audiphones, public address equipment for outdoor and indoor use, photoelectric cells and race timing equipment. In many of these products the Bell system has a dominating position and sometimes a controlling position by virtue of the control or exclusive licensing of patents."

## Employ 4500 Researchers

Since 1916 and through 1935, says Judge Arnold, the Bell system spent \$242,541,569 on research work, "probably more than the total budget of any university in the United States during the period." It employs some 4500 persons in its research laboratories and, in addition, has arrangements with other groups for "mutually exclusive exchange of information which is available to no independent inventor."

"The individual achievement is becoming more and more difficult to identify and evaluate as organized research becomes our greatest source of invention," he continues. "And so the trend of recent decisions has been to emphasize more and more the character of the individual achievement rather than the qualities of the product in determining patentability. We have held that a

step forward which, considered in connection with the highly developed condition of the art, might reasonably be expected from the research of highly trained specialists is not invention. Thus, neither the result of great industry in experimental research nor the successful product of a gradual process of experimentation over a period is invention.

"Patents are not intended as a reward for a highly skilled scientist who completes the final step in a technique, standing on the shoulders of others who have gone before him. By the same token they are not intended as a reward for the collective achievement of a corporate research organization . . . The practice of requiring the expert employes of research organizations to assign in advance all their future patent rights to the organization, itself reflects the respective contributions of the organization and the individual to these so-called inventions. The 'inventor' is paid only a salary, he gets no royalties, he has no property rights in the improvements which he helps to create.

"To give patents for such routine experimentation on a vast scale is to use the patent law to reward capital investment, and create monopolies for corporate organizers instead of men of inventive genius."

Under the system of organized invention, says Judge Arnold, each man is given a section of the hay to search. "The man who finds the needle shows no more 'genius' and no more ability than the others who are searching different portions of the haystack."

"We are bound," he concludes, "to interpret the patent law in the light of its purpose declared by the Supreme Court, to reward individual and not group achievement."

# Bureau of Mines Experts To Push Work on Synthetic Fuel Plants

WASHINGTON

NOW THAT the Senate and House have passed legislation authorizing the Bureau of Mines to construct and operate demonstration plants to manufacture synthetic liquid fuels from coal, lignite, oil shale and "other substances," bureau officials are studying their approach to this enterprise.

It is their present feeling that the first move will be made on the oil shale deposits of the western states, regarded as a relatively simple matter. The preliminary move would be a program of testing all known types of retorts. After the best type of retort had been decided upon it will be easy to plan and lay out a plant.

It would take longer to carry out an experimental program to determine details of a plant to produce fuel oil and gasoline from coal and lignite. Preliminary estimates are that initial costs of produc-

ing synthetic gasoline at the demonstration plants will range somewhere between 7 to 23 cents a gallon, but that as experience accumulates the costs will be reduced. It costs about 5 cents a gallon to manufacture gasoline from petroleum.

Inclusion of "other substances" among those from which synthetic fuel oil and gasoline may be made under the bill was a last-minute House amendment. It appears to open the way toward inclusion of alcohol in the synthetic liquid fuel program.

Bureau of Mines engineers say that successful culmination of the synthetic liquid fuel program would bring about a far greater market for steel than that presented heretofore by the oil industry based on use of petroleum. They estimate that the synthetic industry will require about 8 tons of steel for every 42-gallon barrel of capacity. Pointing to the in-

## Collaboration, Not Antipathy, Held Essential

*Delegates from 16 business, labor, agriculture and civic organizations present views at Atlantic City meeting*

ATLANTIC CITY, N. J.

THERE must be collaboration among conflicting interests in the American economic structure after the war instead of antipathy, with each pressure group working for its own interests, was the gist of a statement issued at the First National Conference on Postwar Problems at the Claridge hotel, Atlantic City, N. J., attended by more than 50 delegates from sixteen leading business, labor, agriculture and civic organizations.

"There must be more equity in the distribution of the national income among industry, labor and agriculture," such diverse interests as the National Association of Manufacturers, American Federation of Labor, and Congress of Industrial Organizations, agreed at the meeting.

Robert Watt, international representative, AFL, and chairman of the special press committee of the conference, made this statement to reporters in the presence of Hugh O'Connor of the NAM and secretary of the press committee, Dr. Emerson Schmidt, Chamber of Commerce of the United States, and J. Story Smith, Aeronautical Chamber of Commerce of America, who stood by to show their approval of the statement.

Delegates at the convention agreed that the survival of the private enterprise system will depend upon its performance in supplying a maximum of employment after the war and that peacetime production must be expanded to provide a level of national income much higher than the United States ever enjoyed in prewar years. If this is not done, the delegates predicted that the government probably will take over in some form or degree of socialism sooner or later.

Dr. Schmidt, speaking about an accelerated economy after the war, said that the country must bake a "bigger pie" so that everyone in the country could get a bigger slice. Mr. Watt at the same time sounded out in favor of an economy of plenty.

Prof. Sumner H. Slichter, economist of Harvard University, urged industry to plan boldly for higher production and high employment. He suggested stretching out the demand for goods and industrial replacements over several years and a broad program of national and local building. To prevent violent ups and downs in business, he emphasized the need for twentieth century devices to stabilize business.



**FAVOR CO-OPERATION:** Delegates attending the first national conference on postwar problems at the Claridge hotel, Atlantic City, N. J., agreed that there must be co-operation among the nation's conflicting economic groups to make a more prosperous America after the war. Two of the postwar planners at the meeting were Wilfred Sykes, left, president, Inland Steel Co., and S. Bayard Colgate, chairman of the board, Colgate Palmolive Peet Co., Jersey City, N. J. NEA photo

information they have on the synthetic industries in Germany and England, as well as that which they have developed in synthetic gasoline production at the Pittsburgh Experimental station pilot plant, they are optimistic about its future possibilities.

Debate in Congress over the bill revealed that it is not the intention of Congress to put the government in the oil and gasoline business. The bill, as its sponsors made clear, is aimed at having the government bear the expense of the experimental program, and that experience and information gained will be placed at the disposal of private industry.

The program, it was estimated, will cost not more than \$30,000,000. It is to be launched as soon as possible without interfering with the war effort, as insurance against petroleum depletion should the war drag out longer than now expected.

### Estimate \$20 Billion Margin Left for Business Expansion

American business as a whole will spend about \$36,000,000,000 reconvert-ing its facilities to peacetime production when the war ends and will have between \$10,000,000,000 and \$20,000,000,000 left for plant and employment expansion, S. Morris Livingston and E. T. Weiler, economists of the Commerce Department, estimate.

They estimated that business holdings would amount to between \$47,000,000,000 and \$58,000,000,000, with maximum

reconversion costs amounting to about \$8,000,000,000 for wartime taxes, \$4,000,000,000 for plant reconversion, \$8,000,000,000 to replenish civilian goods inventories, \$11,000,000,000 for equipment purchases, \$3,000,000,000 for re-extension of consumer credit and \$2,000,000,000 for deferred maintenance.

### Support CED's Contract Termination Suggestions

On the highly important and controversial question of war contract termination policies, New England's industries stand squarely behind the recommendations made recently by the Committee for Economic Development, Nathan Tufts, chairman, industrial committee, New England Council, told the New England congressional delegation in Washington.

The four recommendations made by CED's research division were: 1. Creation by Congress of a war contract settlement board with powers to establish uniform and simplified policies for guiding war agencies; 2. delegation of clear-cut authority to contracting agencies to make final settlements within the board's framework of policies and procedures; 3. congressional legislation which will enable expeditious legal handling of contract disputes, and 4. the right for every contractor and subcontractor to obtain mandatory loans from the government in amounts equal to a substantial proportion of proper settlement claims.

# PRIORITIES-ALLOCATIONS-PRICES

Weekly summaries of orders and regulations, together with official interpretations and directives issued by War Production Board and Office of Price Administration

## INSTRUCTIONS

**EXCESS ALLOTMENTS:** Excess or unused allotments of controlled materials which originated with WPB field offices should be returned to such field offices. They may be returned by letter if it is impractical for the person returning the allotment to obtain a copy of form CMP-32.

**BRASS MILL PRODUCTS:** Definition of an item of brass mill product, used in rules governing warehouse deliveries of such items, has been modified to indicate that differences in temper will differentiate one item of copper and brass sheet from another. Formerly, both length and temper would differentiate one item of such sheet from another.

**STEEL WIRE:** Steel wire used in making brooms may be ordered under procedures applicable to maintenance, repair and operating supplies under CMP regulation No. 5. Allotments of controlled materials need not be obtained, therefore, by broom manufacturers to place orders for such wire. MRO procedure may be used regardless of whether the manufacturer placing an order for steel wire normally charges it to operating expense in his normal accounting procedure.

**MRO RATINGS:** An amendment to direction No. 5 of Priorities Regulation No. 3 makes changes in phraseology for the purpose of clarification, and prohibits the extension of AA-1 and AA-2 blanket maintenance, repair and operating ratings to secure production materials on the list attached to the direction.

**CONSTRUCTION:** Authorizations on CMPL-224 or CA-1456 is the equivalent of a P-19-h authorization as far as delivery of restricted items for construction is concerned. P-19-h was the form of order issued to applicants to authorize construction and assign ratings on materials required for essential projects. With the introduction of CMP, P-19 authorizations were superseded by CMPL-224, which in turn was superseded by form CA-1456 on Feb. 15, 1944.

**EQUIPMENT:** A new and standardized form has been approved to take the place of the 20 forms that previously covered 52 items of equipment. The new form, WPB-1319, will supplant the old variations of WPB form 1319, as well as many others and will cover the entire field with the exception of those coming under the head of the old PD-1A and PD-3A, which are applications for certain preference ratings.

**ABRASIVE GRAIN:** Producers of abrasive grain, who also act as distributors, may take advantage of the small order certification provided by order M-319 to obtain deliveries of grain from other producers for resale to fill small orders without further processing. Grain obtained in this fashion may not be used to fill allocated deliveries, but only to meet small orders, as defined. It is subject to the 60-day inventory limitation set by the conservation order, and is not to be reported as part of the purchaser's inventory when making out his proposed production schedule nor should it be included by a purchaser in his application to WPB for authorization to set aside his own grain to fill small orders.

## L ORDERS

**FLUID-FOOD TRUCKS:** Reference to information that should be supplied when filing form WPB-1319 for authorization to sell, transfer or convert fluid-food trucks, trailers, or tank tractors has been eliminated. Henceforth, the report must contain information called for by current instructions issued with the form. (L-1-j)

**ENAMELED WARE:** Manufacturers of

enameled ware may produce before July 1, 1944, half as many enameled cold pack canners as they were made in the year ended June 30, 1941. (L-30-b)

**ELECTRICAL APPLIANCES:** Application forms, used by manufacturers in making various reports on ship resistance wire and commercial cooking appliances, have been revised and redesignated as follows: WPB-1319 instead of PD-556; WPB-1600 instead of PD-655; and WPB-1477 instead of PD-500. (L-65)

**POWER TRUCKS:** Reference to information that should be supplied when filing form WPB-1319 for authorization to sell, transfer or convert industrial power trucks has been eliminated. Hereafter, WPB-1319 shall be filed in quadruplicate and shall contain information called for by current instructions issued with the form. (L-112)

**BEARINGS:** A new order, L-145-a, provides: Only manufacturers designated as "authorized producers" may make anti-friction bearings in specified large sizes; a maker not designated as

**MINING EQUIPMENT:** Manufacturers of mining equipment have been relieved of the necessity of filing monthly reports on schedules for 40 items of equipment; they may be required to submit a report at any time, should such report be deemed necessary. Additional exemptions may be granted whenever it is justified by the supply-demand situation. An amended list of all "mining equipment," giving CMP code numbers (list A) has been appended to the order.

Requirements for substitution and conservation of critical materials has been eliminated from the order since this end either is achieved by other controls or is no longer necessary. (L-269)

**WELDING EQUIPMENT:** Filing of WPB-1319 is required now as the authorized form for the delivery of resistance welding equipment. Formerly, WPB-2752 had to be filed to obtain authorization for delivery of this type of equipment. (L-298)

**CONTAINER MACHINERY:** All deliveries of new and used container machinery, including that used for packaging and labeling, can closing, can making, glass jar and bottle making and cleaning and reconditioning, will be restricted after March 1, 1944. An AA-5 priority or better rating is required for delivery of this type of equipment. Manufacturers now must file monthly operational reports. Several exceptions are provided to permit transfer of lease agreements and machinery as a result of actions at law, ownership or corporate changes, etc. (L-332)

## M ORDERS

**ZINC:** Remelt zinc has been removed from allocation and scrap zinc deliveries no longer are controlled. Order M-11 no longer requires dealers to obtain a preference rating of AA-5 or better before making shipment, effective April 1, following filing of new applications on March 12.

Producers may make shipments upon notification from a purchaser of the date and serial number of his authorization certificate. (M-11)

**CRANES:** Order M-225, dealing with overhead traveling cranes, has been revoked. Deliveries of such cranes in the future will be scheduled under the general scheduling order, M-293, under immediate jurisdiction of the WPB Tools Division. No liabilities that were incurred under it are affected by the revocation. Overhead traveling cranes, together with rotary, locomotive and gantry cranes, monorail systems for motor driven cranes and carriers, chargers and manipulators, are brought under the jurisdiction of the Tools Division by table 12, as amended Feb. 19, to order M-293. Overhead traveling cranes are designated class X products under the order, which means that monthly reports on proposed delivery schedules must be filed with WPB. After March 1, many producers may be excused from filing these monthly reports. (M-225, 293)

## P ORDERS

**RAILROADS:** Operators of transportation systems have been authorized to schedule a majority of materials for the final three quarters of 1944 without the necessity of seeking each quarter's authorization on form WPB-2585. However, certain items, designated as "special," will continue to be ordered under a revised WPB-2585 to be filed not later than 45 days in advance of beginning of each quarter. These items include: Steam injectors, mechanical lubricators, roller bearings, stokers, superheaters and headers, air and hand brakes, brake beams, bolster springs and couplers.

Rail track accessories, and track material will be handled as in the past. "Track accessories" under controlled materials code 2026 now include only joint bars, tie plates, spikes and bolts. "Track materials" include the B-products such as frogs, crossings, switches, switch stands, rail anchors, rail braces, guard rails, guard rail clamps, gage rods, clip bolts, rail clips, and nut locks, which are required for track maintenance.

Copper and copper-base alloy products produced by a cast iron foundry owned by an oper-

## INDEX OF ORDER REVISIONS

Subject	Designations
Appliances, Electrical	L-65
Bearings	L-145-a
Cranes	M-225, 293
Enameled Ware	L-30-b
Equipment, Mining	L-269
Equipment, Welding	L-298
Machinery, Floor	L-222
Machinery, Container	L-332
Railroads	P-142
Trucks, Fluid-Food	L-1-j
Trucks, Power	L-112
Zinc	M-11

### Price Regulations

Brass Mill Scrap	No. 12
Lead	No. 69
Machines and Parts	No. 136

an "authorized producer" of bearing sizes listed in the order may refer potential customers for those sizes to an authorized producer, or may accept the business and place the production contract with an authorized producer; any factory that might previously have made some bearings of the specified sizes, but is not now designated as an authorized producer, must keep its equipment for making such goods, and in such condition that it may be utilized within one month, if so ordered by WPB.

Exceptions to the order provide: Any orders placed before Feb. 19, 1944, may be completed, even though the factory filling them is not listed as an "authorized producer;" producers whose monthly shipments of all antifriction bearings did not exceed \$60,000 in November, 1943, are not bound by the terms of the order.

Authorized producers for one or more of the specified bearing sizes are: Marlin-Rockwell Corp., SKF Industries Inc., Fafnir Bearing Co., Torrington Co. (L-145-a)

**FLOOR MACHINERY:** Manufacturers and distributors of floor sanding, floor finishing, floor maintenance and rug scrubbing machines, industrial vacuum cleaners and blowers now are required to file a monthly report on production and shipments where production is scheduled. Reports will be made on WPB-3495 and will be due on or before the 15th of each month for the preceding month, except that January, 1944, production must be reported by Feb. 29. (L-222)

ator or on toll agreement are not covered by order P-142. Application for authority to secure these products is issued on form GA-1338 pursuant to application made to the Copper Division on WPB-2433. (P-142)

## PRICE REGULATIONS

**BRASS MILL SCRAP:** Ceiling price of 8.62½¢ per pound, f.o.b. point of shipment, has been established for briquetted cartridge brass turnings. (No. 12)

**LEAD:** Bayfield, Wis., has been established as a new basing point for sales of primary lead. Maximum price for lead, delivered at Bayfield in carload lots, is established at 6.50¢ per pound. (No. 10)

**MACHINES AND PARTS:** Only actual extra costs of the material or transportation resulting from manufacturers or machinery service suppliers purchasing materials in an emergency, at the request of the buyer, from a source more expensive than the current usual source, may be added to the maximum prices of machines and parts and machinery services. These extra costs must be billed to the buyer separately and a copy of the invoice forwarded immediately to the Machinery Branch, OPA.

Manufacturers and resellers of machinery, who have found their production costs materially increased by the increased cost of pure silver solder and babbitt metal containing silver, may increase their prices by the amount of the increased cost of domestic and treasury silver actually used in each machine or part being priced. (No. 136)

## Some Machinery Makers To Get More Metals

ONLY the most essential civilian needs are receiving favorable action by the Requirements committee of the War Production Board on petitions for increased output. Allocation of controlled materials for the second quarter of 1944 will include an increased amount to be used for the manufacture of new pulp, paper mill and converting machinery, according to the WPB. No additional employment will be permitted for the specific purpose of making paper mill machinery, nor will additional materials be allotted to manufacturers situated in critical labor areas.

Allocations for the production of meat packinghouse machinery and equipment may be reshuffled and a larger quota percentage assigned to manufacturers located in less critical labor areas should the present production program fall behind schedule in those localities where labor is scarce.

A limited number of domestic electric ranges are expected to be made available for essential civilian needs in the third and fourth quarter of this year. Plans are being formulated for carrying out a special war emergency program for the production of 17,000 ranges per quarter to meet the requirements of the Office of Civilian Requirements and Federal Housing Authority and 5000 ranges for military, export, and Federal Public Housing Authority. Production of ranges will be permitted only in plants where such production would in no way interfere with war work.

No program for the production of several of the smaller electrical appliances, such as mixers, juice extractors, and electric heating pads, for civilians can

# Steel Industry Must Maintain Maximum Production, Says Whiting

*Slightly lower military requirements are offset by increased need for many essential civilian items, resulting in generally well-booked position of the industry. . . Producers cautioned to observe provisions of CMP*

MAXIMUM production must be maintained by the steel industry to meet military and essential civilian requirements, John T. Whiting, director, Steel Division, War Production Board, said last week in scouting a false notion that steel producers can rest on their oars and relax their efforts.

Mr. Whiting said that while it is true that reductions in some military programs have resulted in slightly lower military requirements for steel, this drop has been offset by increased need for many essential nonmilitary items. He specifically pointed to the stepped-up requirements of steel for railroad equip-

ment, track material, farm machinery, gas and oil facilities and food containers as responsible for the fact that allotments of steel to claimant agencies in the second quarter of 1944 are about equal to those for the first quarter.

"A few producers," Mr. Whiting said, "have idle capacity as a result of a lack of demand in their particular territory or for their specific product. However, a careful check of the order book positions of all producers indicates that the industry, in general, is very well booked and should operate close to capacity during the first half of the year.

"With this situation, it is very important that there be no relaxation in the efforts of the industry to maintain maximum production. Naturally, all of the WPB orders and regulations, including the Controlled Materials Plan, remain in full force and effect and must be observed.

"Producers are particularly cautioned to observe the provisions of the CMP in respect to the maximum tonnages which may be booked and not to accept orders in excess thereof.

"The splendid co-operation of the employees and management of the steel industry has been a vital factor in the success of our country's war production program. I know this fine spirit will be maintained until the complete victory is won."

## WPB To Consult Labor On Reconversion Proposals

Labor has a very direct interest in the shifts of production-emphasis which lie ahead and the War Production Board will consult with labor on the same terms as with industry in working out the readjustments that are to come, Donald M. Nelson, WPB chairman, told leading representatives of organized labor at a recent meeting. He emphasized that the overall magnitude of the munitions program is scheduled to remain at about the present level and will require the energies of an overwhelming proportion of labor and management.

"As you know," Mr. Nelson said, "we have already provided that plans and proposals for resumption of civilian production will be taken up in detail with industry advisory committees. I can assure you that we are making arrangements now to provide for identical consultation with labor representatives.

**Now is the time to think  
about Molybdenum...**



With both molybdenum and tungsten again available for use in high speed steel, consideration of their comparative performance is timely.

Before the war, a careful recording of comparative tests converted many users and tool makers to molybdenum high speed steel. During the tungsten shortage, when use of a high percentage of molybdenum types became mandatory, most users could not watch the performance of their tools carefully enough to draw conclusions

on their respective merits.

Reports from large tool producers and users confirm that molybdenum high speed steels, when properly heat treated, perform at least as well under different kinds of shop conditions as the tungsten types which they replace.

Given equal performance on any particular type of work, an investigation of the saving in machining cost effected by molybdenum steels will prove well worth while.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING  
DATA ON MOLYBDENUM APPLICATIONS.



MOLYBDIC OXIDE, BRIQUETTED OR CANNED •  
FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

**Climax Molybdenum Company**  
**500 Fifth Avenue • New York City**

*Display by industrial designers and stylists unlikely to reveal latest designs of car of tomorrow. . . Cutbacks in war orders make possible closer screening of potential subcontractors. . . Continental duplicating Packard tooling*

A GROUP of industrial designers and stylists, closely associated with the automotive industry in this area, currently is sponsoring a display of their collective talents at the mid-town Scarab Club. The salon exhibit includes about 100 drawings and photographs, plus a few models, mostly on the automotive theme. There are cars of the future, buses of tomorrow, trucks of the day after tomorrow, airplanes, cabin cruisers, and a number of products in the household appliance field such as stoves, refrigerators, combination kitchen and bathroom units and a variety of smaller items like streamlined lawnmowers, etc.

To the casual visitor, the display is interesting and reflects a lot of artistic talent, but to someone who has been in reasonably close touch with designers' activity, the showing is, to say the least, obsolete. Many of the renderings are three and four years old, some doubtless are ideas rejected by the clients to whom they were submitted, while still others are pure flights of fancy of the designers.

Represented are the works of the following, listed alphabetically and not in order of importance: R. Au Werter, I. D. Bingman, Frederico, Leonard Keller, Don Mortrude, Puffer Engineering Co., Ray Russell, Sundberg & Ferar, Duane Swibold, Edward Henry Tackney, John Tjaarda & Associates, George W. Walker, Williams and Tweney, and Lawrence H. Wilson. All are from the Detroit district, and it is the stated intention of the organizers of the exhibit to form a Detroit industrial designers association with this nucleus, perhaps later including some of the hundreds of other stylists who are active in this type of industrial work.

Such an association would appear to be a somewhat hazardous venture, for these stylists are temperamental individuals, strongly jealous of each other's work. Perhaps that is why the current exhibit contains little of a striking or new nature. Obviously the "hot" designs are being kept under wraps, either because the stylist himself wants it that way, or because his client is not inclined to tip his postwar hand. So the attempt to harmonize a score of conflicting artistic temperaments may be something akin to trying to organize a United States of Europe.

Certainly the designers' exhibits add very little to the conception of the postwar automobile. Rather they recall the comment of Edgar C. De Smet, executive engineer, Willys-Overland Motors Inc., Toledo, O., who told the SAE here six weeks ago:

"A typical article on the postwar automobile invariably includes one or more

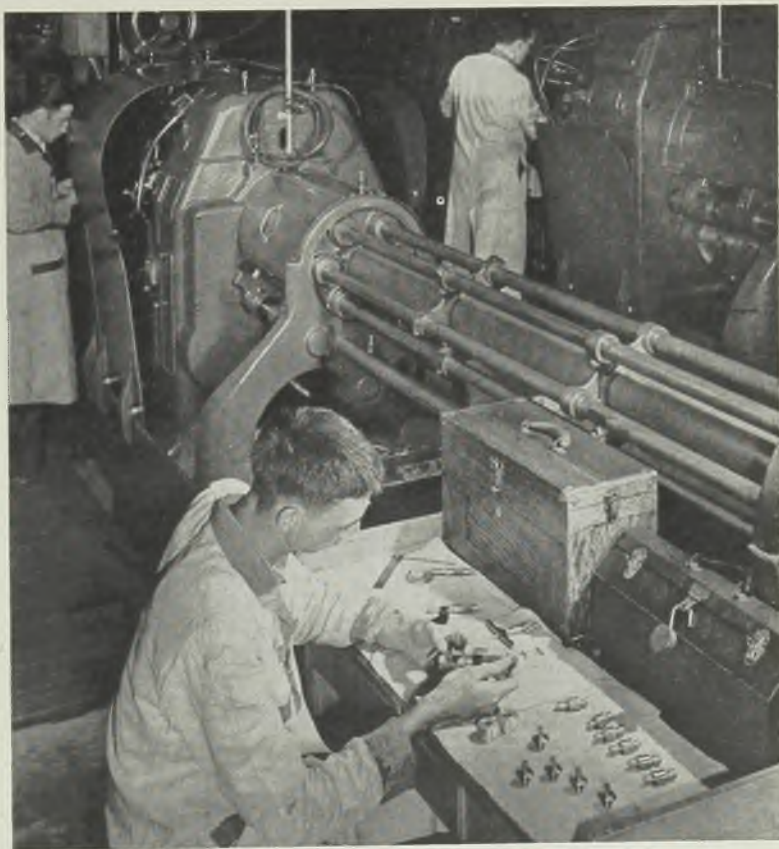
illustrations of a super-streamlined vehicle, a cross between an over-sized beetle and a traveling show case, the product of the artist's fertile brain and of his versatile and carefree air-brush, which is supposed to carry the reader's imagination beyond the physical realm of earthly things. Even though the writer may have buried somewhere in his article some cautious statement regarding the age or period in which his creation may actually come to pass, the designs and illustrations of the ultimate car are inevitably displayed most prominently, thus leaving their permanent mark on the minds of the casual readers and passersby who are unquestionably in the greatest majority.

"The name of the designer is most always prominently displayed along with a list of his other accomplishments so that the entire article resolves itself to a

self-advertisement by the stylist rather than an announcement and description of a new product.

"The obvious reason is that the stylist has no actual physical product to sell. He merely sells talismans and magic carpets in the form of beautiful pictures at fanciful prices. He has a remarkable dislike for details of construction, a definite aversion to production problems, and a superb contempt for anything pertaining to money or cost, with the obvious exception of his own fee 'for services rendered'.

"The creator of a new product is not the wishful thinker nor the waver of the magic wand. If an artist painted a picture showing a bouquet of blue and green roses, he would, no doubt, show great originality, but the fact that he thought about blue roses before anyone else did, does not make him a great floriculturist unless he can follow up his idea and produce such a flower in real life. We would not want to go on record and state that Leonardo da Vinci invented the helicopter, nor that Jules Verne originated the submarine, even though they left definite evidence of



**MICROSCOPIC TOLERANCES:** This worker at the Pesco Products Co., Cleveland, checks the dimensions of a valve blank to make certain the measurements of the piece fall within the microscopic tolerances permitted. These blanks were just turned on automatic lathes, which are used also for turning blanks for connectors, rotors, gears, retainer nuts, and other parts for pumps and accessories for aircraft and other uses



**NEW ARMY WEAPON:** Shown recently for the first time in Cleveland is this new Army multiple-gun weapon mounted on half-trac produced by the White Motor Co., Cleveland. Four 0.50-caliber machine guns are mounted on a power-driven turret. It is highly effective against low-flying enemy strafing planes. NEA photo

preliminary conception of such devices. If we think that way, we may as well get ready now and prepare a special niche in the hall of fame for the creators of Flash Gordon and Superman."

Pronounced change has come over the war subcontracting picture in the last 45 days. Where it formerly was often necessary to sift down through the lists of subcontractors to the bottom level to find a plant to do a certain job, substantial cutbacks in schedules have meant that numerous plants nearer the top level have been freed for new work, so it is now a matter of screening subcontractors carefully to place work with shops which have demonstrated ability to perform on time.

#### Oldsmobile Signs New Contract

A case in point is the Rolls-Royce engine which Continental Aviation & Engineering Corp. is now planning and tooling. Bulk of manufacturing operations is being subcontracted, and in recent weeks there has been some reshuffling of contracts. Latest development is the signing of the Oldsmobile division of General Motors to handle machining operations on crankshafts and connecting rods, as well as a certain percentage of cylinder barrels. Oldsmobile has had some free capacity by virtue of cutbacks in gun schedules.

Others coming into the Continental Rolls-Royce picture as subcontractors are the Ranger Airplane Engines division of Fairchild Engine & Airplane Corp. in the East, and Lycoming division of Aviation Corp. at Williamsport, Pa. Both these companies are said to have had schedules reduced, permitting them to take on some of the Continental program.

As nearly as possible, Continental is duplicating Packard tooling on the Rolls-Royce, at least on all principal parts.

Purchasing is on schedule and few difficulties are being experienced with either raw materials or machine tools. The first group of five engines is scheduled to be completed in July, with peak production a year from that time. The fact that the Air Forces are proceeding with a program of this size, which will not come to fruition before July, 1945, reflects the military view that no early termination of hostilities is expected.

Part of the Rolls cylinder barrel machining work will be handled by Kelsey-Hayes Wheel Co. in Detroit, which has re-equipped its former steel foundry and is already in operation, machining barrels for Packard. The Kelsey steel foundry had a disastrous history, said to be a repeat of an earlier experience. At one time cast armor steel tank turrets were being produced there, using Brackelsburg melting furnaces. Defects in a number of castings resulted in shutting down the foundry last year, and in recent months every vestige of the former melting, molding and conveyor equipment has been ripped out and much of it junked to make way for the machinery required to handle the cylinder barrels. Even large quantities of new firebrick on hand were reported dumped into holes in the floor as fill during the conversion.

The Packard gray iron foundry, idle since its conversion last year to production of aluminum castings for the Rolls engine, may be reopened shortly to produce cylinder blocks on a limited scale. Some extensive changes in cupola melting equipment likely would be required to bring hourly output down to the moderate schedules in prospect.

Joseph W. Frazer, former president of Willys-Overland and prior to that associated with Chrysler, has purchased the Warren City Tank & Boiler Co.,

Warren, O., now producing landing barges and related equipment for the Navy Department which owns the plant but leases it for operation to the Warren company, a subsidiary of Taylor-Winfield Corp. The plant was built two years ago at a cost of \$9,000,000, with machinery and equipment valued at around \$1,000,000. Mr. Frazer, now spending much of his time in Washington, reports he has no other plans for the company other than continued production of war goods.

Considering only various types of vehicles for civilian and military use, projected Ford output for eleven months of 1944 will approach 200,000 units.

Interviewed recently at Chattanooga, Tenn., Henry Ford is quoted as saying, "We have all our facilities ready and we can bring cars out at once when the war is over."

Production of new automobile parts has increased 59 per cent within the last year, according to figures compiled by the National Automobile Dealers Association. Further surveys show supplies of needed functional parts for automobiles seven years old or less will continue fairly good, while parts for 1935 and older models will become increasingly difficult to locate.

Milton A. Holmes, for many years associated with truck manufacturing in Michigan and in 1932 chairman of the executive committee of Continental Motors, has been appointed acting regional manager for the Smaller War Plants Corp. in Detroit.

Studebaker Corp. plant is daily absorbing nine carloads of lumber, 3000 per cent above peacetime requirements and a volume which in one year would furnish enough building material for homes of a city of better than 10,000. Bulk of the daily 250,000,000 board feet goes into crating for export shipment of military vehicles.

#### Nash To Build Proving Grounds

Nash has just purchased a large tract of land 26 miles from its Kenosha, Wis., plant for eventual construction of a proving grounds for automotive vehicles. Plans have been drawn in detail for the new test area which will provide about every conceivable driving condition topographically, including circular concrete track, half-mile circular rough blacktop track, half-mile stretch of corduroy gravel and test stretches of Belgian block, deep loose sand, rutted mud and water submerged areas, 15 miles of winding gravel road and a rough log road. Building facilities and equipment for handling 20 test cars daily will be erected.

A little recognized phase of all forms of war production is the amount of spares and duplicate parts which must be provided. On some aircraft products spares run all the way up to 100 per cent. On jeeps, every group of 100 completed vehicles must be accompanied by, among other things, "bobtails"—complete engines except for heads and crankcases, and by 15 "scats"—engine blocks only.



# SPEED!

—ONE HOUR'S PRODUCTION OF ZINC ALLOY  
DIE CASTINGS ON A HIGH SPEED MACHINE



The 300 "gates" shown above were produced in this die casting machine in one hour—and each "gate" contains six different castings\*. Thus you are witnessing the production of zinc alloy die castings at the rate of 1800 per hour!

This is a plunger die casting machine—the fastest machine there is—in which only zinc alloys can be cast. The higher melting point alloys cannot be used because continuous contact of the molten metal would attack the iron plunger, causing it to stick in its cylinder. Zinc alloys have only a very moderate effect on the steel and iron with which they come in contact in the molten state.

The "castability" of zinc alloys in high speed machines is only one of the many reasons why zinc alloy die cast-

ings are the most widely used under normal conditions. Every die casting company is equipped to produce zinc alloy die castings, and will be glad to discuss their other economic and physical advantages with you. Or write to The New Jersey Zinc Company, 160 Front Street, New York 7, New York.

*\*The six castings on the "gate" are a plumbing drain, 3 radio parts for Army tanks and 2 electrical connectors.*



**ZINC**  
FOR DIE CASTING ALLOYS

The Research was done, the Alloys were developed, and most Die Castings are specified with  
**HORSE HEAD SPECIAL** (  $99.99 + \%$  Uniform Quality ) **ZINC**

*Light plane manufacturer warns distributors and public not to look for revolutionary designs immediately upon termination of war. Will seek to continue capacity operations offering improvements as they develop in step with progress*

LOOKING ahead to the postwar period, Taylorcraft Aviation Corp., Alliance, O., after a comprehensive survey of the present position of the light plane manufacturer and prospects for postwar business, has launched a campaign to assure continuation of capacity operations after the wartime production rush is over.

Sales department of the company recently issued a bulletin to distributors and dealers warning against over-optimistic prophecies about postwar planes which will incorporate every kind of gadget from constant-speed propellers to blind-flying instruments and de-icers and still sell at automobile prices.

Every manufacturer dreams of producing such craft, says Taylorcraft, but adds that anyone with sufficient experience knows that such an achievement will hardly be possible the moment the war ceases.

"We believe our industry will progress faster if it is not hampered by having the general public and new representatives expect a miracle plane at a miracle

price overnight," the company's announcement states.

Taylorcraft disclosed that it has been working on an entirely new design in the "family" class for the past two years. Just how long a period of time will be involved between the "mockup" stage and the finally completed, ready-to-market plane, however, is an unknown quantity. Consequently, the company asks its public to look rather to the continuation of present proven designs, plus what improvements can be attained therein, with the more advanced designs to come as additional products later.

## Heavy Bombers Contain 3000 Pounds of Copper

American heavy bombers of the Flying Fortress and Liberator types contain about 3000 pounds of copper and its alloys and the fighter planes of the Thunderbolt and Mustang class contain approximately 700 pounds each, the Copper and Brass Research Association,

New York, revealed in a recent report.

In its study regarding the use of copper in war equipment, the association found that between 950 and 1000 pounds of copper and its alloys are used in an M-4 armament tank, 250 pounds in 105-millimeter howitzers, 28,000 pounds in 1,000,000 cartridges for small arms, 3,000,000 pounds in battleships of the Iowa class which have a displacement of 45,000 tons, and 350,000 pounds in a submarine.

In an hour of firing a 105-millimeter cannon about 1000 pounds are consumed and in ten minutes of firing a 37-millimeter anti-aircraft gun an additional 1000 pounds are used. A paratroopers' radio set contains 2 pounds of copper and field telephone switchboards require more than 17 pounds.

## Warplane Makers Organize Plastic Tooling Society

Production of "plastic tooling" was given added impetus recently in New York city with formation of the National Society of Plastic Tooling by representatives of five major aircraft firms in the eastern United States.

The new organization held its organizational meeting early in February at Hotel Vanderbilt. Delmar Anderson, superintendent of production planning and tool design for the Buffalo warplane plants of Curtiss-Wright Corp., was elected president of the new society. Besides Curtiss-Wright, the four other major aircraft companies participating, were: Bell Aircraft Corp., Consolidated-Vultee Aircraft Corp., Grumman Aircraft Engineering Corp. and The Glenn L. Martin Co.

Elected vice president of the new organization was Thomas A. Herbert, superintendent of the plastic, plaster and foundry departments in the Allentown, Pa., plant of Consolidated-Vultee Aircraft Corp.

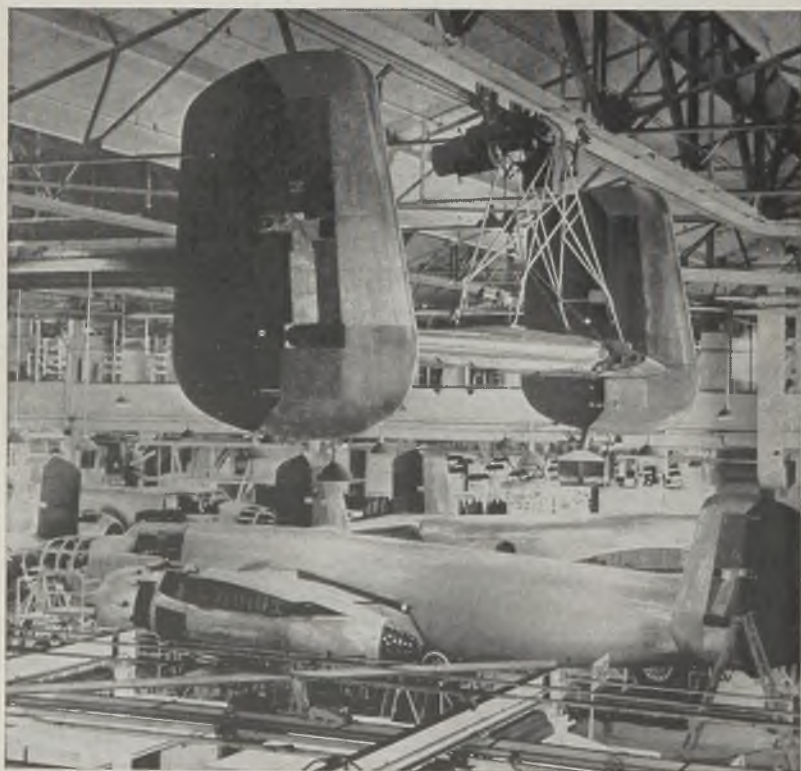
The society also elected Harry W. Tomkins of the Buffalo warplane plants of Curtiss-Wright, as secretary, and Charles H. Miller of Bell Aircraft Corp., Buffalo, treasurer.

## Air Transport Engineering Group Formed by SAE

Organization of an SAE Air Transport Engineering Activity Committee to facilitate co-operative solution of engineering problems arising in air line operation has been announced by the Society of Automotive Engineers.

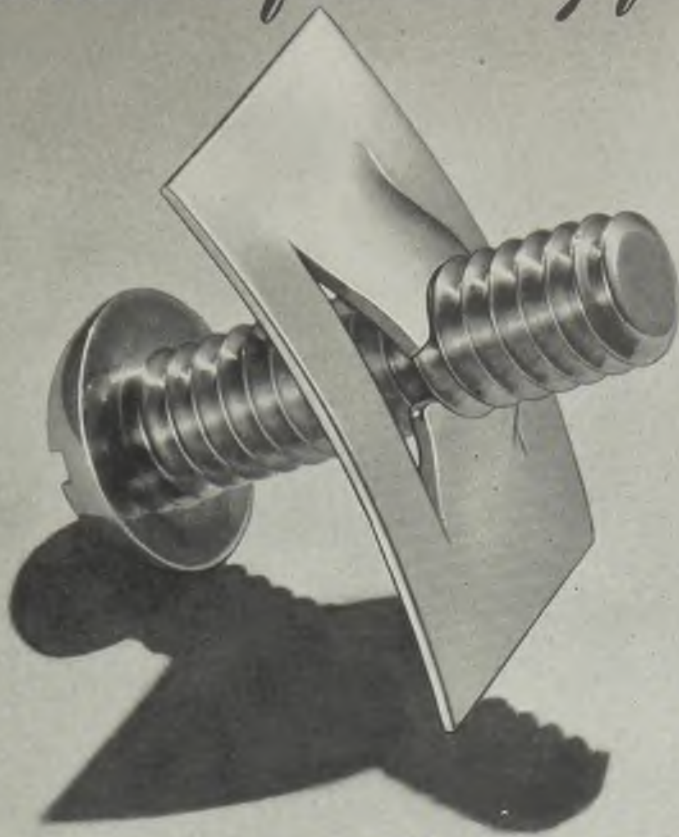
William Littlewood, engineering vice president of American Airlines Inc., Jackson Heights, L. I., N. Y., has been appointed chairman of the committee, which becomes SAE's eleventh professional activity.

Members of the new committee are: Vice chairman, Thomas Wolfe, Western Air Lines Inc., Los Angeles; meetings chairman, Charles Froesch, Eastern



**SPEEDING PRODUCTION:** Overhead trolley conveyor swings a twin-rudder B-25 tail section over the assembly line at North American Aviation Inc., Inglewood, Calif. Expeditious movement of bulky yet light sections in aircraft plants has taxed the ingenuity of materials handling engineers. Note special supporting frame for keeping a firm hold on the rudder and elevator subassembly

# *Speed Nuts* perform more than a fastening function



They prevent vibration loosening by means of their exclusive Double Spring-Tension Lock that ABSORBS the vibration • They are applied faster and so reduce assembly time and costs, tremendously • They avoid use of wrenches and needless handling of parts • They are even made in scores of ingenious shapes that completely eliminate two or more parts • Their wide bearing surface removes the need for spanner washers • They save from 50% to 80% in weight • If you do not have our 20 page summary catalog No. 185, write for your copy today.

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Airlines Inc., New York; membership chairman, H. D. Hoekstra, Civil Aeronautics Administration, Washington; W. G. Ainsley, Sinclair Refining Co., East Chicago, Ind.; Peter Altman, Detroit; A. L. Beall, Wright Aeronautical Corp., Paterson, N. J.; and A. W. Dallas, Air Transport Association of America, Washington.

Also Col. Harold R. Harris, Air Transport Command, Washington; J. A. Herlihy, United Air Lines Transport Corp., Chicago; K. O. Larson, Northwest Airlines Inc., St. Paul, Minn.; Harold R. Porter, Transcontinental & Western Air Inc., Kansas City, Mo.; Capt. C. H. Schildhauer, Naval Air Transport Service, Washington; Humphrey Toomey, Pan American Airways System, Miami, Fla.; and Edward Warner, Civil Aeronautics Board, Washington.

The committee is authorized to deal with the engineering problems of air transport operations, and to work with air line engineering departments and with operators of lines transporting passengers and cargo by plane. It will have, in the field of air transportation, functions similar to those of the SAE Transportation & Maintenance Engineering Activity in the field of highway transportation. Similarly, it will be concerned with the work of operators rather than of manufacturers of equipment.

Organization of the prospective activ-

ity indicates recognition of the growing needs of air transportation and of the expected postwar expansion of air line passenger and air cargo services. The committee will foster the program of the SAE Air Cargo Meeting, and the programs of such other meetings as come within its scope.

## New Anti-ice Boot for Propellers Is Announced

Safer warplanes are promised in a new anti-ice "boot" for propeller blades which the Goodyear Tire & Rubber Co. announced last week. Employing synthetic rubber compounded especially to conduct electricity, the "boots" can be installed on propellers for new airplanes and on propellers already in use. They have the added advantage of protecting airplane propellers from sand and heavier objects up to limited sizes which might otherwise damage a propeller irreparably.

The "boots" were developed under the direction of Dr. L. B. Sebrell, head of Goodyear's new \$1,325,000 research laboratory in Akron.

Dr. Sebrell reported that the "boots" provide complete elimination of past hazards due to iced propellers such as impairment of a propeller's air "bite"; undue strain on the engine mounts as a result of one blade icing more heavily

than the others, and the possibility of ice formations from the propellers damaging the fuselages or wing surfaces.

## Develop Process Bonding Pure Aluminum with Steel

American airplanes now are capable of flying farther, faster and higher than their predecessors as a result of a new development which chemically bonds pure aluminum to steel, J. Carlton Ward Jr., president, Fairchild Engine & Airplane Corp., revealed recently.

"The process has been used in the production of our aircraft engines for more than a year," he said. "Its application to the automotive and air conditioning industry as well as to the other fields where efficient heat transmission or strength and lightness are required, is without limit."

Marshall G. Whitfield and Victor Sheshunoff, research engineers, Al-Fin Corp., wholly owned Fairchild subsidiary, developed the technique.

## Plane De-icer Developed By Goodrich and Bendix

Perfection of a new "electronic ice-pick" to give airplane pilots accurate and instantly variable control of their de-icer equipment in combating every type of ice formation was revealed recently by the B. F. Goodrich Co. and the Eclipse-Pioneer division, Bendix Aviation Corp.

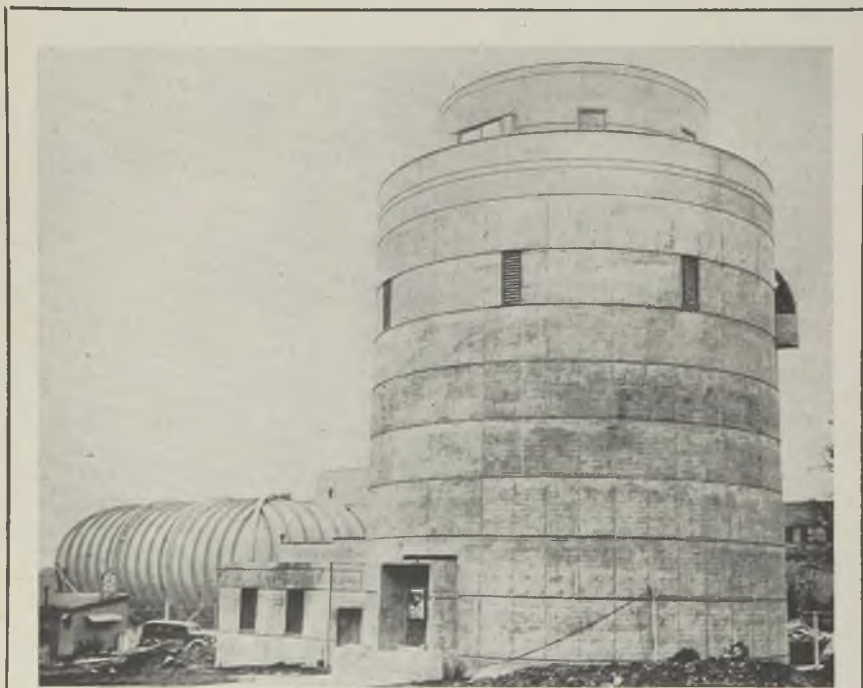
Perfected after 10 years of research the new method is technically known as a "manifold solenoid de-icer system with electronic control," said W. A. Reichel, director of engineering for Eclipse-Pioneer. It already has passed rigorous flight tests.

Using the rubber "boots", the new system makes possible a more selective method of inflating and deflating the tubes along the wing edges so that ice broken loose by the pulsating rubber can be carried off by the slip stream, said J. E. Gulick of the Goodrich company.

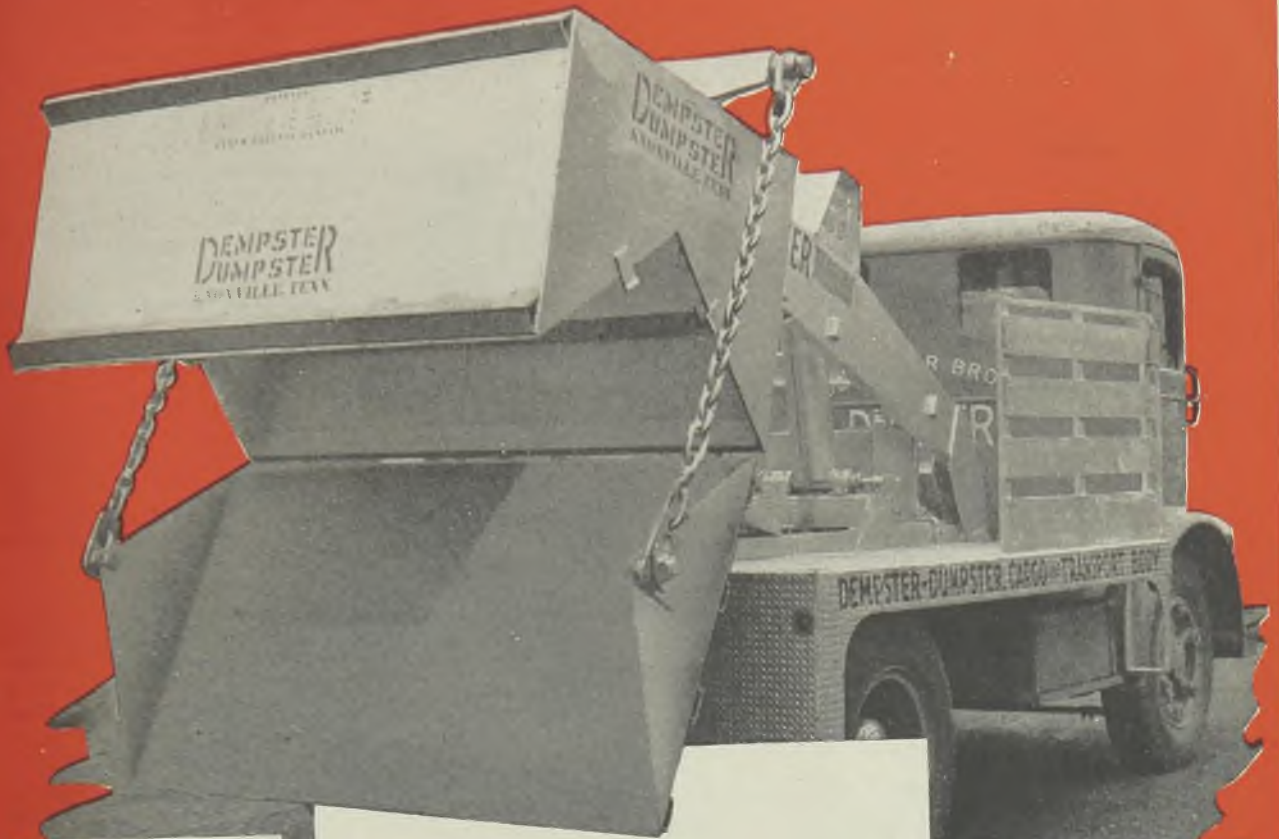
## Plastic Covers Protect Aircraft Parts in Process

What is probably the first application in the aircraft industry of protective plastic covers for parts in process is now in use at the East Hartford plant of the Pratt & Whitney Aircraft division, United Aircraft Corp.

First part to receive such a protector is a clutch drive shaft. Machined with splines on two of its dozen diameters, with two threaded sections and four micro-finished surfaces, this shaft was susceptible to damage in process. Its largest diameter, nearly in the center, was prone to act as a wheel and consequently shafts rolled against each other at every opportunity, resulting in nicks and scratches.



**WORLD'S BEST:** Army Air Forces Materiel Command's new vertical wind tunnel, most modern and complete of its type in the world, is nearing completion at Wright Field, Dayton, O. Engineers say they can test parachutes and three-foot models of planes in the tunnel which cost \$250,000. The planes, floating in the 70 to 135-mile-an-hour air stream, can be dived, brought out of a spin, and accomplish other maneuvers by activating magnetic rings around the test chamber which, in turn, activate controls on the plane. NEA photo



## DEMPSTER-DUMPSTER UTILITY!

★ Hundreds of firms of every industrial classification are finding the Dempster-Dumpster indispensable because of its utility.

Once a Dempster-Dumpster Hoisting Unit is mounted on a truck it immediately becomes a multiple purpose piece of plant equipment. At the same time, material handling service of the truck is simplified and increased tremendously through the use of multiple bodies of various designs.

The primary purpose, of course, of the Dempster-Dumpster, is for handling materials, be they heavy, light, liquid, dust, unfinished or finished. But its service doesn't stop here. Illustrated on this page are a few examples of Dempster-Dumpster Utility! Shown at left top, note height of boom extension which is telescoped into back position or quickly detached, when not in use. Left center shows Dempster-Dumpster in material handling service with boom extension removed. At left bottom, handling sheet steel with boom extension attachment. And, in the same manner, a heavy duty compressor is being moved bodily—pictured at right top. At right center, inner-plant transfer of 6½ tons of steel shafting in a large, southern steel plant. At right bottom, the possibilities of emergency dumping of materials from conventional trucks is shown.

These illustrations will, no doubt, suggest other uses for the Dempster-Dumpster in your plant. Write for fully illustrated catalog No. 242, showing what the Dempster-Dumpster can do for you.

# DEMPSTER DUMPSTER



Dempster Brothers, Inc., 224 Shea Road, Knoxville 17, Tennessee



ALTON P. HALL

Alton P. Hall, formerly assistant sales manager, New York office, Bethlehem Steel Co., Bethlehem, Pa., has been appointed assistant general sales manager, American Chain & Cable Co. Inc., Bridgeport, Conn. Mr. Hall will make his headquarters in New York.

J. Richard Adams, works manager, Crucible Steel Casting Co., Lansdowne, Pa., has been elected vice president in charge of operations.

Carryl A. Asher, vice president and eastern sales manager, Electro Refractories & Alloys Corp., Buffalo, has been elected to the board. Mr. Asher's headquarters are in New Haven, Conn.

Bert Conway has been named vice president in charge of manufacturing for Aviation Corp., with headquarters at Detroit. Since last April Mr. Conway has been manufacturing co-ordinator for the corporation. Arthur W. Gratop has been named supervisor of Aviation Corp.'s newly-formed publicity bureau, located at the offices of American Propeller Corp., Toledo, O., a division of the corporation.

Dr. Irving Langmuir, associate director of the General Electric Research Laboratory, Schenectady, N. Y., has been awarded the Faraday Medal of the Institution of Electrical Engineers, London. The medal is given in recognition of world-wide services to electric science and engineering.

W. L. Stancliffe, vice president in charge of sales, American Car & Foundry Co., New York, has been elected to the board of directors.

R. C. Hill, who has been affiliated with United States Rubber Co., New York, for the past 11 years, has joined National Enameling & Stamping Co., Milwaukee, as manager of the Stove division.

W. Neal Gallagher, president and general manager, Automatic Washer Co., Newton, Iowa, will resign as executive



N. I. MEKEEL JR.

secretary and treasurer, American Washer and Ironer Manufacturers' Association, effective March 31, because of increasing responsibilities in his own business. Mr. Gallagher is a past president of the association.

N. I. Mekeel Jr. has been appointed manager of the grating department, Blaw-Knox Co., Pittsburgh. Mr. Mekeel succeeds Elmer E. Brodhead, who has formed a business connection on the West Coast.

Alvi T. Twing, who has been manager of Remington Arms Corp.'s Denver plant, has rejoined E. I. Du Pont de Nemours & Co. as superintendent of the cellophane division of the Tonawanda, N. Y., plant. George L. Reynolds also has returned to the company as chief supervisor of the Cel-O-Seal plant in Tonawanda.

George H. Clark, vice president, Formica Insulation Co., Cincinnati, has been appointed a member of the Subcommittee on Wood and Plastics for Aircraft of the National Advisory Committee for Aeronautics for 1944.

Lewis M. Gill has been appointed an alternate public member of the National War Labor Board, and Frederick H. Bullen has been named his successor as chairman of the Fifth Regional War Labor Board.

Dwight R. Means, formerly technical director, Columbia Chemical division, Pittsburgh Plate Glass Co., Pittsburgh, has been named assistant to the vice president in charge of the division, E. T. Asplundh.

F. H. Yocum and A. H. Goode have been appointed representatives in the New York area for C. M. Kemp Mfg. Co., Baltimore, and will make their headquarters in the Graybar building, New York.

Paul A. Jenkins, regional production service manager, WPB, Chicago, has been named district manager of that of-

fice. Howard E. Richardson, who has been acting Chicago district manager since the resignation of James Driscoll, returns to full-time duty as deputy director for priorities distribution with the added responsibility for the foundry and forge shop program in Illinois, Indiana, Iowa and Wisconsin. George A. Dinnen, regional salvage manager, has been named manager of the regional production service division.

Gordon K. Tollaksen has been appointed purchasing agent, Dumore Co., Racine, Wis., succeeding J. M. Hamilton.

A. H. Freeman has been appointed sales representative in the Detroit territory for American Foundry Equipment Co., Mishawaka, Ind., filling the post left vacant by the death of M. T. Mortensen. R. L. Orth also represents the company in Detroit.

George Dolan has been placed in charge of the San Francisco branch office recently opened by Kennametal Inc., Latrobe, Pa. Mr. Dolan was at one time associated with Joshua Hendy Iron Works.

W. H. Moore has been appointed technical manager of the Meehanite Metal Corp. in India. Manufacturing rights for Meehanite castings have been granted to the Indian Hume Pipe Co. of Wadala, Bombay, India.

Lyman D. Warner has been named sales manager, Crocker-Wheeler division, Joshua Hendy Iron Works, Ampere, N. J. Mr. Warner had been assistant sales manager of Crocker-Wheeler division since 1941.

William F. Vosmer, until recently an executive in the Steel Section of WPB in Washington, has rejoined Republic Steel Corp., Cleveland, as manager of railroad sales, succeeding the late Em-



P. E. FLOYD

Who has been appointed assistant general sales manager, Allegheny Ludlum Steel Corp., Brackenridge, Pa., noted in STEEL, Feb. 21, p. 66.

mett Conneely. Before entering government service Mr. Vosmer had been sales manager of Republic Steel Corp.'s Bar division.

Harry Weaver, formerly foundry engineer, Caterpillar Tractor Co., Peoria, Ill., has been appointed foundry engineer for Brillion Iron Works, Brillion, Wis.

Walter L. Rice, vice president, Reynolds Metals Co. Inc., Richmond, Va., has been elected president of Reynolds Mining Co., a subsidiary. Mr. Rice succeeds R. S. Reynolds, who becomes chairman of the board.

Paul E. Minsel, who has been engaged in personnel and labor relations work with General Motors Corp., Detroit, since 1936, has joined Eaton Mfg. Co., Cleveland, as head of the public relations department.

Dr. John M. Schweng has been appointed chemical research engineer and director of bacteriological research, Turco Products Inc., Los Angeles. Previously Dr. Schweng had been chemical research engineer at Lockheed Aircraft Corp., Burbank, Calif.

Boyd R. Hopkins has been named sales representative on the West Coast for Thermex division, Girdler Corp., Louisville, Ky.

G. Bronson Philhower has been named sales representative in metropolitan New York and in New England for Tube Trus Inc., Louisville, Ky.

E. J. Baughman has been appointed Los Angeles district sales manager, Edison General Electric Appliance Co. Inc., Chicago.

E. B. Scott has been appointed sales manager, Engine division, Enterprise Engine & Foundry Co., San Francisco. Prior to his appointment Mr. Scott was manager, Repair and Maintenance division, and assistant to C. G. Cox, vice president of the company.

R. C. Edgar, formerly a publicity representative and editor of the employees' publication for Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and recently engaged in the advancement of flood control for western Pennsylvania, has been appointed personnel director, Allegheny Ludlum Steel Corp., Brackenridge, Pa.

Kenneth W. Rowe, former executive officer, OPA, Washington, has been appointed assistant to the president, Howard Aircraft Corp., Chicago and St. Charles, Ill.

Daniel E. Lehane, formerly associated with Westinghouse Electric & Mfg. Co., Trafford, Pa., has joined the metallurgical staff of Russell, Burdsall & Ward Bolt



VINCENT A. SHEALS



P. L. DAFOE



W. F. ROSSITER

& Nut Co., Port Chester, N. Y.

Vincent A. Sheals has been appointed designing engineer, Cable Engineering division, Schenectady, N. Y., Works, General Electric Co., succeeding W. C. Hayman. Mr. Sheals had been assistant designing engineer of the Cable Engineering division since 1939. Mr. Hayman will be available as a general consultant.

P. L. Dafeo, who has spent 15 months in the tank, automotive center office of the chief of ordnance, Detroit, has returned to his former position as sales manager, Central division, Acme Steel Co., Chicago. Mr. Dafeo was chief of the packaging section, a division of the tank, automotive center.

R. W. Hofheins has been appointed field technical engineer, Willys-Overland Motors Inc., Toledo, O., filling the vacancy caused by the recent death of Henry Amon. Mr. Hofheins, formerly president of Amphibian Car Corp., Buffalo, has been acting as technical adviser in the South Pacific for the United States Navy for the past year.

James W. Yanda has been appointed general manager in charge of research chemical development engineering, Chemical Research For Industry Inc., Cleveland.

Maj. Gen. Follett Bradley, United States Army (retired), who formerly commanded the First Air Force at Mitchel Field, L. I., and who held the post of air inspector at Army Air Forces headquarters, Washington, has been named assistant to the president of Sperry Gyroscope Co., Brooklyn, N. Y.

Clarence F. K. Appel, comptroller, Follansbee Steel Corp.; S. B. Kingham, comptroller, National Tube Co., and Lawrence E. Moore, controller, Vanadium-Alloys Steel Co., all of Pittsburgh, have been elected to membership in the Controllers Institute of America.

A. D. Robertson has been appointed

assistant manager, Motor division, Norwood, O., works, Allis-Chalmers Mfg. Co., Milwaukee.

Wynn F. Rossiter has been appointed district manager at Hartford, Conn. for Carpenter Steel Co., Reading, Pa., succeeding Charles W. Olsen, who is retiring after 33 years in that post.

R. H. Rausch, president of Automatic Paper Machinery Co., Hoboken, N. J., has been elected a director of Fairchild Engine & Airplane Corp., New York. Mr. Rausch and J. Ford Johnson, a director of the corporation, were elected to the executive committee.

L. A. Ver Bryck has been named New York district sales manager, Pittsburgh Steel Co., Pittsburgh. W. F. Boore has been made assistant sales manager, steel and wire products, at company headquarters; Joseph G. Smith has been appointed Pittsburgh district sales manager, and W. J. Meyer will assist Mr. Ver Bryck in the New York office.

Henry S. Haight has been appointed representative in North Carolina for Baker Industrial Truck division, Baker-Raulang Co., Cleveland. Mr. Haight operates under the name Haight Engineering Co., with offices at Moore street and Altamount avenue, Richmond, Va.

Philip H. Clapp, formerly district manager at Detroit for the Abrasive division, Norton Co., Worcester, Mass., has been appointed Pacific Coast district manager for the company's Abrasive division, with headquarters in Los Angeles. Donald L. Price succeeds Mr. Clapp in Detroit.

George A. Steuber has been named general manager and a director of Despatch Shops Inc., East Rochester, N. Y.

Fred T. Goes, formerly vice president, Vilter Mfg. Co., Milwaukee, has been elected president, succeeding William O. Vilter, who died Jan. 31. William B. Vilter takes his father's place on the board and has been elected vice presi-



**JOHN O. CHESLEY**

*Who has been named railway sales manager for Aluminum Co. of America, Pittsburgh, as announced in STEEL, Feb. 14, p. 93.*



**FRANK DeCRANE**

*Who has been appointed purchasing agent, Lamson & Sessions Co., Cleveland, as announced in STEEL, Feb. 21, p. 66.*

dent to succeed Mr. Goes, continuing as director of personnel. Mr. Goes is a director of the Air Conditioning and Refrigerating Machinery Association.

**C. G. Wollaeger**, vice president of Milcor Steel Co., Milwaukee, who has been in charge of the company's War

Contract division, has been named vice president in charge of sales; **W. P. Schwarm** has been named sales manager, and **E. J. Cullen**, manager of sales of sheets and roofing products.

**C. William Anderson** has been elected president and treasurer, Specialty Brass

Co., Kenosha, Wis. **Charles M. Anderson** was elected board chairman; **E. H. Kleist**, secretary; **N. J. Anderson**, vice president; **Clarence Anderson**, director, and **John Skuhra**, company office manager.

**Ira B. Stiefel**, manager of industrial relations at the East Pittsburgh, Pa., works of Westinghouse Electric & Mfg. Co. since 1937, has been appointed assistant to the vice president in charge of industrial relations. **William E. Miller** has been appointed general attorney in charge of the company's law and patent department; **William D. Turnbull**, who formerly was vice president and sales manager, Pomona Pump Co., Pomona, Calif., has been named manager of the Westinghouse agency and specialties department, and **Donald W. Gunther** has been made metallurgist at the company's foundry in Trafford, Pa.

**Mundy I. Peale** has been elected vice president and divisional manager, Evansville division, Republic Aviation Corp., Farmingdale, N. Y. **Lloyd D. Brace**, vice president of the First National Bank of Boston, has been elected a director of the corporation.

**OBITUARIES . . .**

**Samuel J. Reeves**, 64, president, Phoenix Iron Works, Phoenixville, Pa., was killed in an automobile accident near Media, Pa., Feb. 17. Mr. Reeves became associated with Phoenix Iron Works, headed by his father, in 1903 and upon the latter's death in 1923 he was named president. Mr. Reeves had been vice president of Cambria Steel Co., and was a member of the American Iron and Steel Institute. The Reeves family has owned the Phoenix Iron Co. for 140 years.

**Lieut. Col. James H. Bosworth**, formerly superintendent, Farrel-Birmingham Co., Buffalo, died Feb. 10 while serving in New Caledonia, the War Department has announced.

**Benjamin Chernyk**, 56, president of Chicago Alloy Products Co., Chicago, died Feb. 15 in that city.

**Jesse J. Ricks**, 64, chairman of the board, Union Carbide & Carbon Corp., New York, and president of the corporation from 1925 until 1941, died Feb. 20 in Plandome, N. Y. Mr. Ricks was an active member of the American Bar Association.

**Ellis J. Gittins**, 77, chairman of the board, J. I. Case Co., Racine, Wis., from 1920 until his resignation in 1935, died Feb. 18 in Racine. In 1924 Mr. Gittins was made chairman of the executive committee of the National Association

of Farm Equipment Manufacturers. At the time of his death he was a director of Young Radiator Co. and of Racine Tool & Machine Co., both of Racine.

**William Hoblitzelle**, 72, president, Smith & Davis Mfg. Co., St. Louis, died Feb. 17.

**John J. Flanagan**, 50, vice president, treasurer and one of the founders of National Mfg. Corp., Tonawanda, N. Y., died in Chicago Feb. 16.

**W. H. Foster**, 70, founder and operator for many years of the Foster Mfg. Co., Elkhart, Ind., died Feb. 7 in Ann Arbor, Mich.

**Fred W. Lemke**, 68, vice president and superintendent, Quality Aluminum Casting Co., Waukesha, Wis., and one of its founders in 1923, died Feb. 16 in Milwaukee following an automobile accident. Mr. Lemke was honored last year by the American Foundrymen's Association for having served 50 years in the foundry industry.

**William S. Gordon**, 70, corporation lawyer, senior member of the firm of Paskus, Gordon & Hyman, and a director of Climax Molybdenum Co., New York, died Feb. 17 in that city.

**John F. Conroy Jr.**, 49, founder and president, National Magnesium Corp., Elkton, Md., died in Wilmington, Del., Feb. 16.

**Eugene E. Miller**, 29, chief estimator for the Wilmington Shipbuilding divi-

sion, Consolidated Steel Corp. Ltd., Los Angeles, was killed in a recent airplane crash near Memphis, Tenn.

**Frank W. Iredell**, 87, retired mining engineer who aided in development of the Corliss engine-driven air compressor used in excavating tunnels and in coal and ore mining, died Feb. 17 in New York. Until his retirement 20 years ago Mr. Iredell had been New York manager of C. & G. Cooper Co., now Cooper-Bessemer Co., Mount Vernon, O.

**Charles E. Hahn**, 53, general manager, Cincinnati Electrical Tool Co., Cincinnati, died Feb. 7 in that city. Mr. Hahn had been a member of the Electrical Tool Institute.

**Raymond M. Hughes**, 46, assistant chief engineer, Great Lakes Steel Corp., Detroit, died there Feb. 14. Mr. Hughes had been associated with Youngstown Sheet & Tube Co. and William B. Pollock Co., both of Youngstown, O., and with Republic Iron & Steel Co. and Trumbull Steel Co., before transferring to Detroit in 1929.

**William J. Davis Jr.**, 75, retired consulting transportation engineer, General Electric Co., Schenectady, N. Y., died there Feb. 18. Mr. Davis had joined General Electric Co.'s testing department at Lynn, Mass., in 1892.

**John McGovern**, 36, director of the incentive plan for Cleveland Graphite Bronze Co., Cleveland, died recently in that city.



# Dominion Considers Increasing Home Output of Farm Equipment

*Production still is governed by war restrictions but manufacture of certain types of machinery is being speeded. Industry urged to consider possibility of enlarging domestic production in postwar era*

TORONTO, ONT.

H. H. BLOOM, administrator of farm and construction machinery, Wartime Prices and Trade Board, stated recently that farm machinery production in Canada continues governed by manufacturing restrictions but output of certain types of equipment is being speeded and will be in good supply by the spring and available for seasonal requirements.

"Total equipment supplies for 1944," he said, "will be 80 per cent of the 1940 figure, with repair parts totaling 156 per cent of that year's tonnage. There is no lack of factory capacity, but we do lack materials and manpower. Because of military requirements, we will still face restriction problems in motors, ball bearings and malleable castings".

He stated Canada was importing 70,000 tons of farm equipment from the United States this year and that 50,000 tons of this would be tractors.

In a report tabled in the House of Commons the War Expenditures Committee pointed out that Canadian agricultural implement manufacturers should study the possibility of producing a much higher percentage of Canada's farm equipment needs. The report as presented to the House stated in part:

"In view of our tremendous industrial development brought about by the war, and in view of the dominant position which Canadian agriculture now holds with respect to food production, it is unthinkable that Canadian manufacturers should continue to supply only 38 per cent of the farm imple-

ments which are used in this country.

"Your committee is of the opinion that such an industrial expansion would fit in with our reconstruction policy and program. Your committee fully realizes that in the past many types of farm implements, now extensively used, were not then used in sufficient quantities to warrant a setting up of expensive plants to manufacture such implements in Canada. Your committee is convinced that the whole situation is completely changed and that the increased number of tractors, as well as other equipment and component parts such as ball and roller bearings now in use, warrants our implement manufacturers making a careful and thorough study of the possibility of manufacturing a much higher percentage of Canada's agricultural implement needs."

Previous to the release of the report there were indications that Canadian plants are preparing to produce a larger part of the domestic demand for agricultural implements. There also are indications that United States companies are preparing to establish manufacturing facilities on this side of the border with this object in view. Announcement was made recently that the John Deere Co. will spend upwards of \$250,000 on a plant at Welland, Ont. Another American company has announced plans for a plant at Winnipeg.

Canadian production of refined copper increased approximately 17 per cent between 1939 and 1942, from 232,000 tons to 270,600 tons. During the same period records show exports of copper have

shown a considerable decline owing to the increase in consumption in Canada.

Valuations of exports of copper products, including blister copper, ingots in this group, rods, etc., and copper in matte; with a fair volume of exports of copper wire and cable, declined from some \$53,000,000 in 1939 to \$52,000,000 in 1940, to \$43,000,000 in 1941 and to around \$36,000,000 in 1942.

Largest single item of export, copper in ingots, bars, slabs and billets, amounted to just under 2,000,000 cwt. in 1942, down about 40 per cent from 1939. The total value of this group was well over \$19,000,000 and almost the entire total went to the United Kingdom. On the other hand a large percentage of Canada's copper wire and cable, insulated, found a market in the United States.

## Connell Named Canadian Metals Controller

F. M. Connell, Toronto, has been appointed Metals Controller to succeed G. C. Bateman who recently was appointed deputy member of the Combined Production and Resources Board. In relinquishing the post of Metals Controller, Mr. Bateman becomes Associate Metals Controller and retains responsibility for handling international problems relating to metals, including dealings with Allied governments in connection with aluminum.

N. B. Davis of Ottawa is named Deputy Metals Controller, and G. C. Monture of Ottawa, formerly executive assistant of the Metals Controller, succeeds S. D. Pierce of Montreal as executive officer representing Canada on the C. P. R. B.

K. H. J. Clarke of Toronto, who was chief of the Allocations division, Metals Control, has been appointed executive assistant to Mr. Connell. He also succeeds Mr. Monture as alternate to J. H. Berry of Toronto on the Crown Assets Allocation Committee. F. V. C. Hewitt of Toronto is appointed Deputy Associate Metals Controller.

## They Say:

"There is no person who can foretell when the war will end. Without that knowledge no man is willing to take responsibility for deciding to tear down war production lines."—**Brig. Gen. Albert J. Browning**, War Department.

"Too many people, particularly in industry, are taking their eyes off war production to look for a place in the postwar parade. The coming invasion of Europe is the most powerful reason for capacity production that I can imagine. Once the people realize this they will demand that the products of war shall come first and that no influence, no industry or union or political group shall stand in the way of production for victory."—**Charles E. Wilson**, executive vice chairman, War Production Board.

"It is easy to be optimistic about the postwar period

because of the present shortage of goods, but what will count in the end is an effective consumer demand backed by dollars. . . . Peacetime purchasing power will have to come primarily from business payrolls and secondarily from government sources."—**Willard L. Thorp**, co-trustee, Associated Gas & Electric Co.

"If economic imperialism should replace the economic isolationism that followed World War I, good neighbor relations with Mexico and all of Latin America will be wrecked. . . . If American business men want a part of the Latin American business, they can have it on a partnership basis. Otherwise, we are likely to see the development of a program calling for Latin American business for Latin Americans."—**John B. Walker**, assistant to the president, United Air Lines Inc.



## Huge New Combat Unit Unveiled

*Ordnance vehicle being built by Pacific Car & Foundry Co. for the Army picks up battle-damaged tanks, half-tracs, armored cars, etc. Is of unusual size, actually being two vehicles in one*

MILITARY secrecy has been lifted on a new type of ordnance vehicle being built by Pacific Car & Foundry Co. at Renton, Wash., and Billings, Mont. Shown in accompanying illustrations, the vehicle is known as the M-26 tank recovery unit.

Believed to be the largest combat unit manufactured for the Army, the retriever, as it is sometimes called, is used to pick up battle damaged tanks, half tracs, armored cars and other ordnance vehicles. It boasts unusual size, being 58 feet long, 12 feet high and 12 feet wide. When loaded to capacity it weighs 80 tons, just twice the weight of two loaded box cars.

Actually the retriever is two vehicles in one. The principal part, manufactured in Renton, is a truck-tractor, designated as M-15. It resembles a tank on wheels, as the cab is fully armored and designed to carry a 50-caliber machine gun on top for either anti-aircraft or level fire.

There are slits in the armor plate through which members of the crew of seven can fire tommy guns with which all are armed.

The truck-tractor has ten wheels—two in front and four pairs in the rear. The trailer has eight wheels at the rear—four abreast and equispaced. The trailer wheels, incidentally, are independently sprung.

Including one spare, the retriever uses a total of 19 tires. One tire, with tube and rim, weighs 900 pounds, and it can be changed only with the use of a vertical lift, which is part of the equipment.

Salvaged tanks ride on two rails on the trailer. A tank is hauled aboard by letting down the tail gates, which form ramps, and attaching two steel cables to it. The steel cables are payed out from two winches in the after part of the truck-tractor. There is a third winch forward which can be used to extricate

the whole unit if it becomes stuck in mud.

The unit is powered with a 6-cylinder Hall-Scott engine developing more than 250 horsepower.

The truck-tractor has a highly complicated transmission system—a normal one, with four speeds ahead and one in reverse, and a second mid-frame transmission which supplies power to the aft winches. When the two transmissions act as a single unit, the vehicle has twelve speeds forward and three in reverse. It is capable of speed up to 30 miles an hour.

As the retriever may operate far from its base for long periods, it has a small stove in its cab for the cooking of canned rations, and it carries large quantities of gasoline and equipment.

Before being delivered to the army, each retriever is test-driven 35 miles at the Renton track. Part of the test is towing the trailer up and down 30 per cent grades while loaded with 40 tons of cement.

The retriever is designed to carry one medium tank or two small ones, or an equivalent weight and bulk in any other army vehicles.





*Fig. 1—The 58-foot tank retriever has seen action in Sicily and Italy. Cab is fully armored; machine gun is mounted on roof*

*Fig. 2—M-26 tank recovery unit showing crew at stations. The unit is equipped with a small stove, canned goods, water and other supplies*

*Fig. 3—Tank recovery unit, with M-4A-1 tank loaded on trailer, raises a dust cloud on the test track. Each unit is given a 35-mile test before delivery*

*Fig. 4—View of the M-26 tank recovery unit with an M-4A-1 medium tank being loaded on the trailer bed*

*Fig. 5—With 30-ton medium tank aboard and loading ramp raised, the tank recovery unit heads for repair base*



# Employment in War Production Little Affected by Cutbacks

*War Manpower Commission reports displaced workers are quickly employed in other plants. Says cutback "jitters" not justified with increased demands for manpower scheduled in many directions*

CUTBACKS in war contracts have released relatively few of the nation's approximately 10 million munitions workers, according to War Manpower Commission estimates.

Despite cancellations and curtailments that are occurring, employment in munitions production is expected to remain at the January level through July of this year. Increased demands for manpower are scheduled in radar, aircraft, landing craft and ship repair industries.

In most cases, contracts have been canceled in areas where there was a demand for labor sufficient to absorb the workers displaced, states the commission. Where it was found necessary or advisable to terminate a contract in a labor surplus area, the procurement agency involved had made an effort to provide another contract that would continue the plant in operation.

Most of the workers laid off as a result of production shifts have been transferred quickly to other essential work, according to United States Employment Service reports. In acute labor shortage areas there has been considerable demand for the workers released. In labor surplus areas, USES offices have also reported more requests for workers than there were displaced workers available. The reluctance of workers to leave their home community to take jobs elsewhere has often hindered efforts to transfer them to war jobs where their efforts were needed.

In many instances, USES officials have reported that women workers did not seek other jobs when laid off but returned instead to their household duties.

Rumors about impending contract changes have proved, in most cases, more confusing and disruptive than have the actual changes. This was due chiefly to the fact that the reports were not based on facts and often were entirely false; responsible officials had not been given an opportunity in other instances to formulate a program for making the necessary adjustments.

Advance warning of a cancellation has had beneficial results wherever given. Where plant management has acted quickly in taking its employes and local WMC and WPB officials into its confidence, rumors have been almost non-existent and confusion minimized, states the commission.

Contract terminations that already have occurred reveal the varied nature of cutbacks. Sometimes plants are closed completely and all workers dismissed. Some-

times a plant with several contracts has one expire without renewal, necessitating release of certain workers; a plant is forced to release part of its force because of decreased orders; or the company is able to use displaced workers to fill shortages in other departments of the same plant. Occasionally, contract cancellations are merely "paper cutbacks", as in the case of a plant anticipating an order which does not materialize.

## To Seek Protection of Women Workers in Cutbacks

With labor needs shifting as war industry cutbacks increase, the women's advisory committee of the War Manpower Commission is seeking establishment of protective policies in the discharge of women workers. Margaret Hickey, committee chairman, last week said suggestions designed to effect sound personnel practices and good labor relations soon will be submitted to WMC Commissioner McNutt.

## Panel Named To Consider The Steel Wage Case

Panel of six to consider the steel wage case was announced last week by the War Labor Board.

Those appointed were:

David L. Cole, second regional board in New York as panel chairman, and N. P. Feinsinger, director of WLB's disputes division, representing the public.

## Employment Declines 1,700,000 During January, Conference Board Reports

AT THE end of January 60,500,000 persons were employed in the United States, including those serving in the armed forces, the National Industrial Conference Board reported last week. This represents a decline of 1,700,000 from the December total and is 4,000,000 under wartime peak of 64,500,000 reported for last September.

Non-agricultural civilian employment, according to the report, was reduced in the month by more than 1,000,000, and a decline of about 500,000 took place in agriculture. Trade, manufacturing

Hugh Morrow, vice president, Sloss-Sheffield Steel & Iron Co., Birmingham, Ala., and Edwin D. Bransome, president, Vanadium Corp., New York, will represent industry, while John Despol, San Francisco, and Stephen Levitzky, Pittsburgh, will represent labor.

The United Steelworkers of America (CIO) are seeking a wage increase of 17 cents an hour and other benefits for all of its members. Any increase granted the steel workers would nullify the "Little Steel" yardstick under which general wage increases are limited to 15 per cent above the wage level in effect as of January, 1941.

## Form Research Committee To Study Steel Case

A Steel Case Research Committee has been established to work with individual companies of the iron and steel producing industry in the forthcoming hearings before the War Labor Board, John A. Stevens, vice president, industrial relations, United States Steel Corp., chairman of the committee, announced last week.

Other members of the committee are: J. C. Argetsinger, vice president and general counsel, Youngstown Sheet & Tube Co.; R. Conrad Cooper, assistant vice president, Wheeling Steel Corp.; J. M. Larkin, vice president, Bethlehem Steel Co., and Lauson Stone, president, Follansbee Steel Corp.

The committee has arranged to carry on various lines of research that may be pertinent to the steel case and to supply data to individual companies. Each company in the steel industry will make its individual presentation before the board.

The committee has engaged the firm of M. K. Mellott & Co., Pittsburgh, as its public relations counsel. Offices of the committee are with the Mellott firm for the present, but other quarters will be acquired when the WLB makes announcement of the city in which the panel will be held.

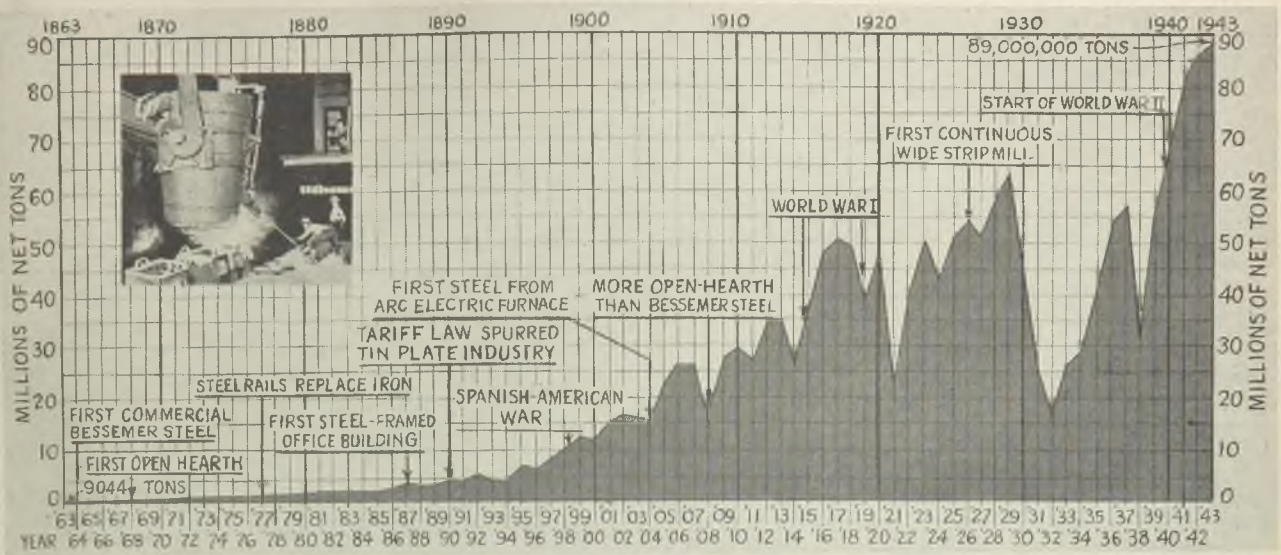
and the Post Office contributed to the January employment drop.

Declines in the transportation, equipment, iron and steel, lumber and automobile industries ranged from 17,000 to more than 50,000. In the nondurable manufacturing group declines were especially pronounced in the food, textile-mill products and chemical industries.

For December the board reported total employment off about 1,100,000 from the preceding month to a level 3,600,000 higher than in Dec., 1942.

# Eighty-Year Record of Steel Production in U. S.

(Compiled by American Iron and Steel Institute)



(After 1933 includes only steel castings produced by companies making steel ingots)

Years	Net Tons	Years	Net Tons	Years	Net Tons	Years	Net Tons
1863	9,044	1884	1,736,985	1905	22,426,821	1926	54,089,014
1864	10,369	1885	1,917,350	1906	26,205,913	1927	50,327,407
1865	15,262	1886	2,870,003	1907	26,166,105	1928	57,729,481
1866	18,973	1887	3,739,760	1908	15,706,037	1929	63,205,490
1867	22,000	1888	3,247,373	1909	26,829,624	1930	45,583,421
1868	30,000	1889	3,792,020	1910	29,226,309	1931	29,058,961
1869	35,000	1890	4,790,319	1911	26,517,238	1932	15,322,901
1870	77,000	1891	4,372,748	1912	35,001,459	1933	26,020,229
1871	82,000	1892	5,518,891	1913	35,056,979	1934	29,181,924
1872	160,108	1893	4,502,395	1914	26,334,594	1935	38,183,705
1873	222,652	1894	4,941,476	1915	36,009,161	1936	53,499,999
1874	241,614	1895	6,848,614	1916	47,906,522	1937	56,636,945
1875	436,575	1896	5,915,492	1917	50,467,880	1938	31,751,990
1876	597,174	1897	8,015,792	1918	49,797,923	1939	52,798,714
1877	637,972	1898	10,004,800	1919	38,831,779	1940	66,982,686
1878	819,814	1899	11,916,640	1920	47,188,886	1941	82,839,259
1879	1,047,506	1900	11,410,928	1921	22,157,853	1942	86,031,931
1880	1,397,105	1901	15,090,426	1922	39,875,277	1943	88,872,598*
1881	1,778,912	1902	16,740,920	1923	50,336,940		
1882	1,945,095	1903	16,279,175	1924	42,483,772		
1883	1,874,359	1904	15,523,074	1925	50,840,747		

\*Preliminary.

## Copper Production

In terms of recoverable metal based on smelter receipts, except the Central and Eastern states which are mill outputs. (short tons)

Region and State in 1943.	January-September	October	November	December (preliminary)	January-December (preliminary)
Eastern States	10,276	1,313	1,122	1,229	13,940
Central States	36,825	4,010	3,897	3,810	48,542
Western States:					
Arizona	300,970	34,490	33,120	33,250	401,830
California	4,941	1,260	1,143	1,250	8,594
Colorado	703	91	71	74	939
Idaho	1,901	177	174	175	2,427
Montana	100,596	11,338	11,360	10,850	134,144
Nevada	51,636	5,917	5,892	5,800	69,245
New Mexico	57,993	6,641	6,512	7,067	78,213
Oregon	5				5
Texas	68	2	2	2	74
Utah	239,347	28,752	26,763	28,350	323,212
Washington	5,596	557	626	530	7,329
Alaska	18	4	2	1	25
<b>Total</b>	<b>810,875</b>	<b>94,552</b>	<b>90,684</b>	<b>92,408</b>	<b>1,088,519</b>

## Secondary Lead

Recovered from purchased white metal scrap, lead content. (short tons)

1943	Total
January	26,911
February	23,422
March	27,177
April	27,040
May	26,416
June	25,228
July	27,221
August	29,714
September	26,259
October	27,138
November	26,927
<b>Total 11 months</b>	<b>293,453</b>
<b>Annual rate 1943</b>	<b>319,864</b>
1942	298,483

## Marine Fittings Hardware

1943	Shipments	Unfilled Orders
June	\$3,481,000	\$23,502,000
July	3,315,000	25,013,000
August	3,711,000	25,774,000
September	3,602,000	26,375,000
October	3,785,000	24,469,000
November	3,790,000	22,721,000

# Tool Engineers Meet in March At Philadelphia

*Extensive technical program is scheduled for three-day convention. No exhibition planned*

AMERICAN Society of Tool Engineers will hold its annual meeting March 26 to 28 inclusive at the Bellevue-Stratford hotel, Philadelphia.

Featuring the technical sessions is an innovation consisting of the presentation at one session of a series of papers discussing all factors relating to the putting into production and production itself of a vital war product. Scheduled for the morning of March 27, it will cover by papers presented by departmental heads of a major industrial producer, the engineering, planning for production, tooling, actual foundry and machining production, and inspection methods, etc., relating to this one product, thus pro-

viding an integrated picture of all the problems involved and how they were met.

The afternoon session will be devoted to new developments in the way of surface finishing methods, with particular stress on honing through papers by Kirk W. Connor, president, Micromatic Hone Corp., Detroit, and A. F. Hasty, Sunnen Products Co., St. Louis.

Monday evening's meeting will be devoted to the integrating of manufacturing, tooling, and personnel to produce war products, with William Jack, Jack & Heintz, Cleveland, revealing the principles on which his company based its production achievements.

The annual meeting will close Tuesday night with the annual banquet. Ray H. Morris, A.S.T.E. president, presiding, and A.S.T.E. past president, T. B. Carpenter, acting as toastmaster.

No show is scheduled coincident with the annual meeting and no blanket plant tours are scheduled.

## BRIEFS . . .

DeBardeleben Coal Corp., Birmingham, Ala., announces its by-product coke, heretofore marketed through a Birmingham sales agency, will be sold

directly through its own sales organization, effective April 1.

Geo. R. Mowat Co., New York, has appointed the Thompson-Hayward Chemical Co., Kansas City, Mo., as exclusive representative for the sale of its protective coatings.

William H. Keller Inc., Grand Haven, Mich., has changed its name to Keller Tool Co.

Pullman Co., Chicago, plans to compete with other forms of transportation in the postwar period with triple-tier cars, 80 feet long, offering beds at perhaps \$1 a night, private-room cars at little more cost than present lower berths and a new luxurious type of car.

Burgess-Manning Co., Chicago, recently was incorporated and, as a subsidiary of Burgess Battery Co., assumed the activities of the Acoustic division, Burgess Battery Co.

Rietze & Co., Louisville, Ky., has been appointed sales representative for the Allen-Bradley line of electric control apparatus. It will handle the southern Indiana and western Kentucky territories.

Meriam Co., Cleveland, has changed its name to Meriam Instrument Co. The same management continues.

Satterlee Co., Minneapolis, recently was appointed exclusive agents for Kent-Owens milling machines in the Minneapolis territory, Kent-Owens Machine Co., Toledo, announces.

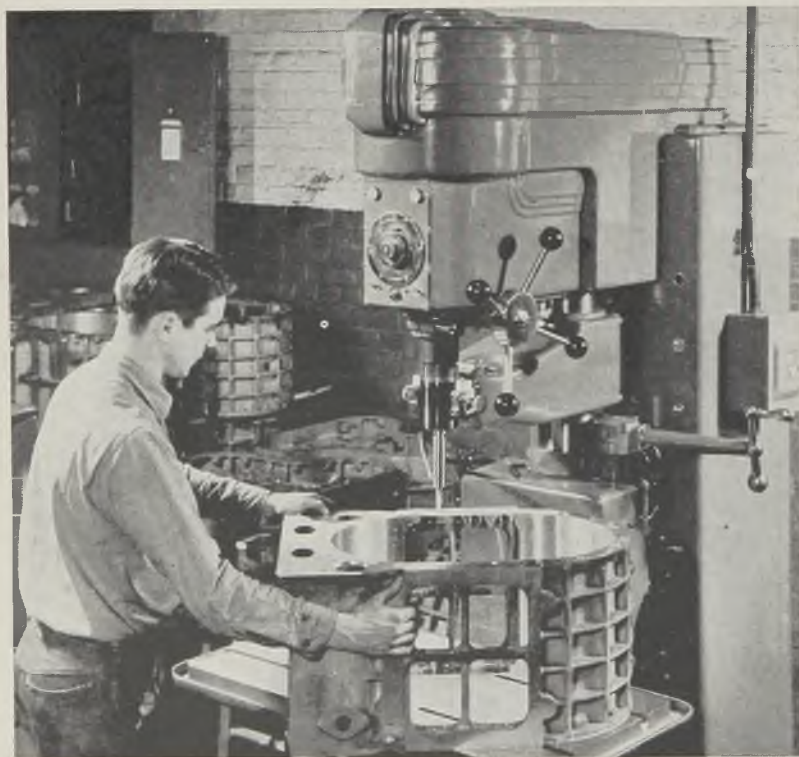
Lincoln Park Industries Inc., Lincoln Park, Mich., is the new corporate name of Lincoln Park Tool & Gauge Co. Carbur Inc., manufacturers of solid cemented-carbide rotary files and cutting tools, has been merged with Lincoln Park Industries Inc.

Ferro Enamel Corp., Birmingham, Ala., recently purchased additional acreage adjoining its plant in order to meet expansion plans.

Dixie Metal Products Co., Birmingham, Ala., has passed from the Bessemer Coal, Iron & Land Co. into the hands of a group of industrialists. New owners are James A. Smith Jr., George Veitch Jr., and Joseph M. Morris.

Johnston & Jennings Co., Cleveland, is operating the Defense Plant Corp.'s detinning plant at Birmingham, Ala., under the name of Alabama Detinning Co.

United States Steel Corp., Pittsburgh, reports its subsidiaries are intensifying efforts to assist the nation's railroads to meet wartime transportation problems in a campaign which already has boosted freight carloads some four net tons per



**SPECIAL FEATURE:** This precision tapping and threading machine produced by the Warner & Swasey Co., Cleveland, is designed for fast, accurate cutting of threads up to class 5 tolerance in plastics, aluminum or hard steel alloys. Its special feature is the hardened and ground lead screw. Brass guide fingers, after being cut with the lead screw itself, follow its precision thread pitch to regulate engagement of the actual die or tap

## Reliance Steel Corp. Elects New Officers

*Resignation of Friedman as president and treasurer brings about reorganization. Disposes of interests*

DIRECTORS of the Reliance Steel Corp., Cleveland, producer and warehouse distributor of flat-rolled steel products, last week elected J. B. Ribakoff, Worcester, Mass., formerly vice president of the company, as new president, succeeding Sol Friedman who has disposed of his interests in the corporation and has resigned as president and treasurer.

Philip P. Brown, formerly secretary of the corporation, was made executive vice president, and Irving R. Zwick, formerly assistant treasurer, was elected treasurer, according to an announcement by Attorney Philmore J. Haber.

The new officers will make their headquarters at the Ivanhoe road plant, Cleveland. The corporation has warehouses in Detroit, Chicago, Worcester, Mass., Lyndhurst, N. J., and Cleveland.

## Wheelco Instruments Co. Sold; New Officers Elected

Assets of the Wheelco Instruments Co., Chicago, have been purchased by Fred A. Hansen and Cary H. Stevenson, vice presidents of the Lindberg Engineering Co., Chicago, and several associates. Business will be continued at the same location under a new corporation, Wheelco Instruments Co.

Officers of the new company are: Mr. Hansen, president; Mr. Stevenson, secretary and treasurer; Richard Schoenfeld and Theodore Cohen, vice presidents of the old firm, as vice presidents. Mr. Schoenfeld will be in charge of sales and production.

The new company plans to expand further into other industrial applications of electronics and supersonics.

Mr. Hansen and Mr. Stevenson will continue to be active in the management of the Lindberg Engineering Co.

## Officials Inspect Zephyr During Layoff for Repairs

Officials of the Edward G. Budd Mfg. Co., Philadelphia, and Burlington railroad, recently made a trip from Chicago to East Dubuque, Ill., to inspect the *Zephyr*, reputedly the world's fastest train, which has been out of service for about one month for complete checkup and refurbishing after nearly eight years' service.



SEVENTY THOUSANDTH: Without frills or trimming, this locomotive, the 70,000th built by the Baldwin Locomotive Works, is shown just before being turned over to the Army. During the 112 years since Mathias Baldwin built "Old Ironsides" (No. 1), the company has averaged one completed locomotive every 14 hours. Inspecting the locomotive are, left to right: Ralph Kelly, president; W. H. Holcomb, operations assistant to the president; W. G. Stetson, general foreman of the erecting shop

car since 1941 through improved loading methods.

—o—

Young Radiator Co., Racine, Wis., recently published a pamphlet which outlines the work accomplished by it for the war effort in 1943.

—o—

Link-Belt Co., Chicago, in order to shorten time required for calculating center distances and chain lengths of chain drives operating over cut-tooth wheels, has computed and published a series of tables which give accurate results.

—o—

General Electric Co., Schenectady, N. Y., reports that its Schenectady plant has operated two years, comprising about 211,124,000 man-hours without a fatal accident. Near this record is the Ft. Wayne, Ind., plant with 200,272,000 man-hours since its last fatality.

—o—

Federated Metals division. American

Smelting & Refining Co., Detroit, has issued a revised edition of its booklet on aluminum alloy standard specifications which includes wrought alloys as well as casting grades and ingot grades.

—o—

Metal Parts Corp., Racine, Wis., has adopted a group life insurance program for its employees. In addition, employees receive protection in the event of sickness or injury, and hospital and surgical benefits.

—o—

Western Electric Co. Inc., New York, has leased area 2 of the Eau Claire Ordnance plant, Eau Claire, Wis., in order to meet increased production demands.

—o—

Westinghouse Electric & Mfg. Co., Pittsburgh, reports net sales billed in 1943 were 47 per cent greater than those in 1942 and amounted to \$714,305,303. Net income was \$22,355,300, compared with \$17,366,841 in 1942.

# THE BUSINESS TREND

## Munitions Index Records First Decline in Year

JANUARY munitions output typified the divergent trends which will characterize production throughout 1944. A year ago, virtually all munitions programs were expanding, and the achievement of quantity production was still a primary aim. However, at present the total munitions program has almost reached the desired peak and the overall volume of production is no longer the main index of success. The chief problem now is to shift production emphasis where necessary and turn out the special types of munitions which are most needed.

Reflecting a fairly general decline in production schedules throughout the entire ground-army munitions list last month, the War Production Board's January index on munitions output declined two per cent below the December level.

Specialized increases, however, occurred in production of several major war programs.

**LANDING CRAFT**—Production of landing craft is now the number one munitions program. January output rose to 91,000 tons; one-fifth more than in December. The goal is to obtain very large deliveries in a short time as shown by the fact that the peak of 164,000 tons scheduled for June is over 80 per cent more than the January rate of deliveries.

**TRUCKS**—Production of heavy duty equipment left much to be desired during January, falling below the December total. Light-heavy trucks, however, increased 16 per cent above the December level.

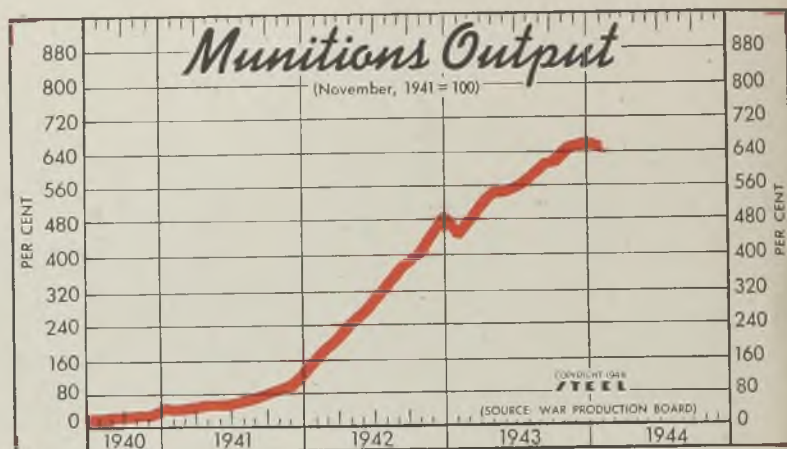
**AIRPLANES**—January output was 8789 planes, against 8802 in December. However, in terms of airframe-weight production was 5 per cent above the December level; 6 per cent if spare parts, etc., are included. It was an exceptionally good month for super-fortresses. Navy dive-bombers also did well.

**SHIP CONSTRUCTION**—Reflecting the shifting of facilities to clear the way for an expanded new program of military type

ships of the attack-cargo and transport classes, January deliveries of merchant vessels were down 1.2 million dead-weight tons, or 40 per cent less than in December. The Maritime Commission shipyards delivered 124 vessels in January, against 208 in the preceding month.

**ORDNANCE**—In line with decreased demands the January output of army ordnance and ground signal equipment was one-eighth below December deliveries. Current levels of production are about adequate to meet present requirements, which, however, are subject to change.

**WPB's MUNITIONS INDEX**—The overall index was off 13 points during January to 649, the first decline since January last year. By major categories, January production recorded the following percentage changes in comparison with December: Aircraft, up 6 per cent; ships (value of construction work done on navy, army and maritime vessels, including repairs and maintenance) down 7; guns and fire-control equipment, down 8; ammunition, down 6; combat and motor vehicles, down 17; communications and electronic equipment, up 4; other equipment up 1.



WPB's Munitions Index  
(November 1941 = 100)

Month	1944	1943	1942	1941	1940
January	649	453	166	41	...
February	...	476	182	45	...
March	...	518	213	52	...
April	...	547	247	60	...
May	...	548	276	57	...
June	...	560	309	59	...
July	...	587	339	64	...
August	...	609	372	72	22
September	...	611	387	83	22
October	...	644	403	91	27
November	...	661	448	100	34
December	...	662	497	133	50

\*Preliminary.

## FIGURES THIS WEEK

### INDUSTRY

	Latest Period*	Prior Week	Month Ago	Year Ago
Steel Ingot Output (per cent of capacity)	98.5	100.0	99.0	99.5
Electric Power Distributed (million kilowatt hours)	3,940†	4,533	4,531	3,949
Bituminous Coal Production (daily av.—1000 tons)	2,158	2,127	2,125	2,033
Petroleum Production (daily av.—1000 bbls.)	4,387†	4,399	4,391	3,874
Construction Volume (ENR—unit \$1,000,000)	\$37.0	\$23.2	\$25.5	\$98.9
Automobile and Truck Output (Ward's—number units)	17,885	17,595	18,000	17,830

\*Dates on request.

### TRADE

	Latest Period*	Prior Week	Month Ago	Year Ago
Freight Carloadings (unit—1000 cars)	790†	795	799	765
Business Failures (Dun & Bradstreet, number)	25	22	23	96
Money in Circulation (in millions of dollars)†	\$20,610	\$20,586	\$20,408	\$15,845
Department Store Sales (change from like week a year ago)†	+2%	+8%	-3%	+19%

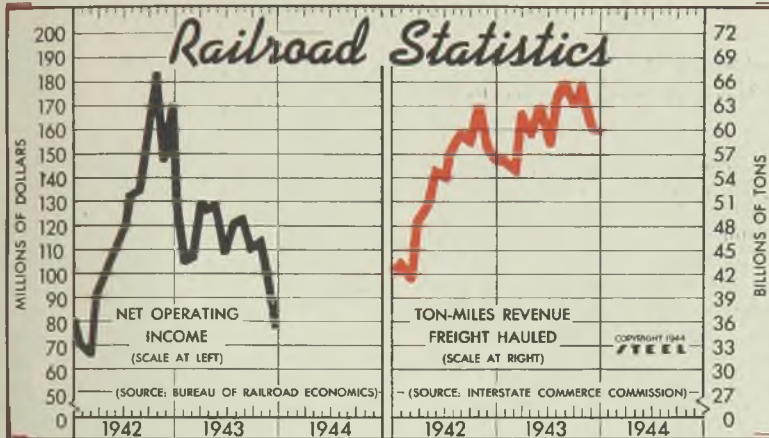
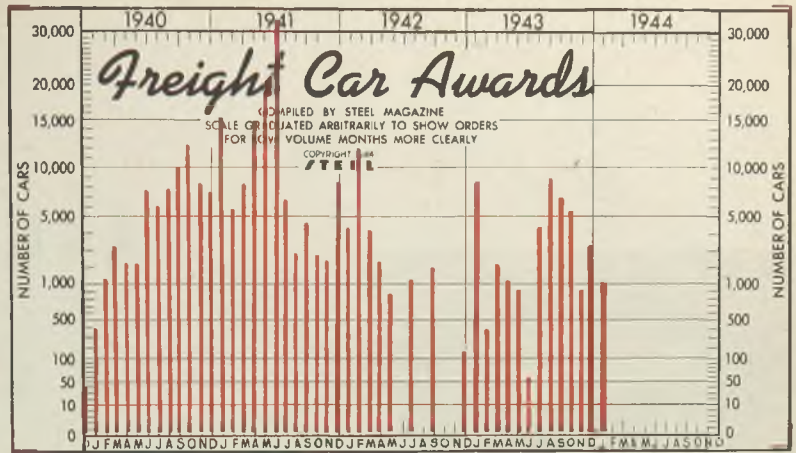
†Preliminary. †Federal Reserve Board.



Freight Car Awards

	1944	1943*	1942	1941
Jan.	820	8,365	4,253	15,169
Feb.		350	11,725	5,508
March		1,935	4,080	8,074
April		1,000	2,125	14,645
May		870	822	18,630
June		50	0	32,749
July		4,190	1,025	6,459
Aug.		8,747	0	2,668
Sept.		6,820	1,863	4,470
Oct.		5,258	0	2,499
Nov.		870	0	2,222
Dec.		2,919	135	8,406
Total		41,355	26,028	121,499

\*Including reinstatements.

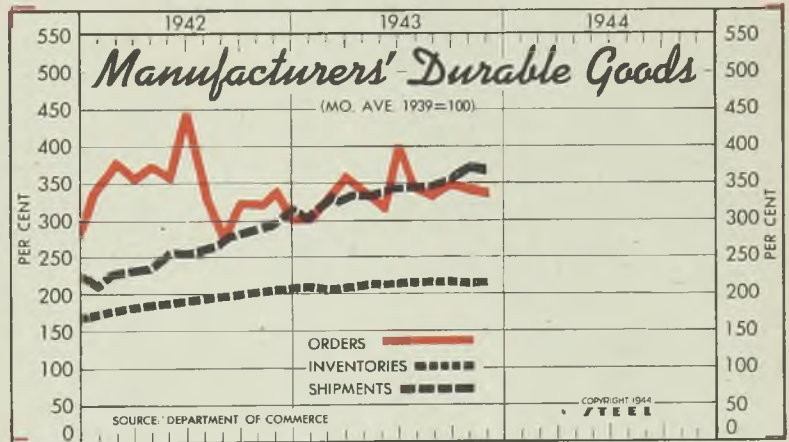


Statistics of Class I Railroads

	Net Operating Income			Ton-Miles Revenue Freight		
	1943	1942	1941	1943	1942	1941
	(millions)			(billions)		
Jan.	\$105.3	\$66.8	\$62.0	55.1	43.0	32.0
Feb.	106.1	64.4	58.5	54.4	40.8	31.1
Mar.	129.6	90.6	80.6	61.2	48.3	37.2
Apr.	127.1	101.6	52.6	59.1	50.0	29.0
May	128.2	109.7	88.6	62.1	54.2	39.7
June	109.7	118.7	93.3	53.0	53.9	40.7
July	120.6	133.6	106.3	63.7	57.0	42.8
Aug.	124.6	135.9	111.3	65.1	58.6	45.5
Sept.	110.2	154.6	104.4	62.5	58.2	44.8
Oct.	113.1	184.7	94.1	65.0	62.2	47.7
Nov.	96.4	148.9	68.9	59.6	57.0	42.8
Dec.	77.2	170.9	79.3	59.4	55.0	41.3
Avg.	\$113.5	\$122.9	\$83.3	60.5	53.2	39.6

Index of Manufacturers Durable Goods

	Orders		Shipments		Inventories	
	1943	1942	1943	1942	1943	1942
Jan.	293.5	333.9	298	214	211.3	179.2
Feb.	326.6	373.4	337	232	209.6	180.8
Mar.	349.2	344.4	330	235	210.7	183.4
Apr.	329.8	362.1	338	239	213.5	186.6
May	313.0	348.4	338	254	213.5	190.2
June	392.7	439.5	343	256	211.8	193.2
July	338.7	321.8	346	264	211.4	195.8
Aug.	325.0	269.4	348	270	213.3	198.0
Sept.	339.5	314.5	356	283	214.7	200.9
Oct.	339.5	312.1	371	289	214.0	204.1
Nov.	330.6	334.7	370	300	214.2	207.7
Dec.		291.1		320		210.1
Ave.		337.1		263		194.2



FINANCE

	Latest Period*	Prior Week	Month Ago	Year Ago
Bank Clearings (Dun & Bradstreet—millions)	\$8,922	\$9,636	\$9,260	\$7,217
Federal Gross Debt (billions)	\$185.5	\$182.1	\$170.9	\$117.1
Bond Volume, NYSE (millions)	\$107.1	\$87.7	\$80.4	\$57.2
Stocks Sales, NYSE (thousands)	4,365	3,512	4,336	6,671
Loans and Investments (millions)†	\$53,256	\$52,177	\$49,539	\$41,475
United States Government Obligations Held (millions)†	\$38,902	\$37,930	\$36,044	\$28,428

†Member banks, Federal Reserve System.

PRICES

	Latest	Prior	Month	Year
STEEL's composite finished steel price average	\$56.73	\$56.73	\$56.73	\$56.73
Spot Commodity Index (Moody's, 15 items)†	249.3	249.0	247.4	246.1
Industrial Raw Materials (Bureau of Labor index)†	112.4	112.4	112.3	108.9
Manufactured Products (Bureau of Labor index)†	100.6	100.5	100.4	100.5

†1931 = 100; Friday series. †1926 = 100.

# NE Steels in the Manufacture of MACHINE TOOL

## PARTS

... gain prestige with engineers through service. Advantages better understood. New processing ideas develop with experience

THE National Emergency steel program has proved beneficial rather than detrimental in the building of machine tools, and it may be expected that techniques of selection and use of alloy steel in this industry will be permanently altered by experience gained since the NE program went into effect.

Using the lean alloys has taught many engineers the real possibilities of steel, whereas previously they were inclined to specify by analysis and rely on wide margins of safety in selecting steel for a given part. New ideas of processing and new techniques for increasing the physical properties of steel have resulted from the war-born necessity to make the most of what we have.

At the National Acme Co. of Cleveland, to take an outstanding example, NE steels have proved equal or superior to SAE grades in the manufacture of alloy steel machine tool parts. This firm, maker of the Acme-Gridley automatic bar and chucking machines, has replaced SAE alloys with NE grades on a broad scale, and in so doing has encountered some very interesting facts about the processing and machining of the wartime emergency steels.

In the National Acme plant, NE steels as a whole are machining just as well as previously used SAE grades, and in some cases even better, depending upon the manner in which they have been heat treated. Their machinability can be further improved by carefully planned annealing cycles, choice of tools, and choice of cutting fluids.

In the opinion of G. H. Griffiths, National Acme metallurgist, it is possible to take any one of the NE grades and, by trying various annealing processes, obtain better machinability than that offered by comparable SAE grades. A certain amount of experimentation is necessary, of course, and the following is an example of some of the methods employed to obtain desirable results:

In the case of NE 9450, used for a large number of gears, the use of differ-

ent annealing cycles resulted in different machinability ratings, although brinell hardness remained in the same range. The only variation was in structure.

—Heating this steel to 1550 degrees Fahr. and furnace cooling it quite slowly to 1150 degrees, gave a structure of rather coarse lamellar pearlite, with a small amount of spheroidization. This structure also was accompanied by a large number of fairly large ferrite patches. Brinell hardness was 187 and machinability was very poor.

—Heating to 1500 degrees Fahr., cooling rapidly in air to 1200 degrees, and holding that temperature for 6 hours, gave a structure of fairly fine lamellar pearlite with a large amount of spheroidization. Free ferrite patches were small, brinell hardness was about 207, and machining qualities were good.

—Heating to 1400 degrees Fahr., cooling fairly fast in air to 1200 degrees and holding that temperature for 5 to 6 hours, gave a highly spheroidized structure with small ferrite patches. Brinell hardness was 200 and machinability excellent.

### Operation Governs Annealing Cycle

Machinability itself, however, is a broad term, and it has been noticed that some machining operations require different microstructures than others. In the use of this same NE 9450, for instance, a lamellar pearlite structure with small patches of ferrite works better on broaching and hobbing, while a mixture of fine and lamellar pearlite with a fair amount of spheroidization appears to be better for turning and drilling operations.

In a case where one part requires two or more types of machining (a gear blank, for instance, which is to be hobbled and drilled) a practical solution is to determine which operation is the most important and govern the annealing cycle accordingly.

Careful selection and correct use of tools and cutting fluids are also important. Cutting conditions, finish and tool



Quenching NE steel gear at National Acme

By George Bissett

President  
Bissett Steel Co.  
Cleveland, O.

life can be improved tremendously by using the correct cutting fluid. These fluids may either be sulphurized oils, (usually containing some chlorine) with or without lard oil, soluble oils or emulsifiable pastes. The type to use depends upon the cutting conditions.

A soft, gummy material requires greater hook on the tool to permit the escape of chips, and requires higher compounding of cutting oil—the addition of more sulphur or chlorine, for instance, which are extremely high-pressure lubricants.

As the material becomes harder and more brittle, hook angle of the tool should be smaller and it is feasible to cut down on the compounding of oils. These general instructions will not only result in higher machining speeds and better results, but will also increase tool life considerably.

Another means of increasing tool life, whether NE or SAE grades are being worked, is to give the tool a high speed casing treatment after grinding. This is done as follows:

Inmerse the tool in a cyanide bath at the same (or slightly lower) temperature which was used in previous tempering or drawing. The time required is seldom more than ½-hour. This treatment produces a very hard, wear-resistant surface on the tool, and will increase the number of pieces per grind up to 500 per cent. Greater tool improvement is obtained in this manner than in chrome plating, and at much lower cost.

#### Bluing, Chromium Also Employed

Other methods for improving cutting conditions are chromium plating and the popular bluing or blackening process. The bluing or blackening process imparts a black-oxide surface which has the faculty of holding oil. This aids machining by adding better lubrication on the lip of the tool, permitting the chip to slide over the tool, and aids in the escape of the chip. Improvement in tool life has been reported by chromium plating but it is necessary here to submit the tools to a heat treatment to drive off the induced hydrogen which causes brittleness. Chromium-plated tools should be heated to temperatures up to 500 degrees Fahr. for 2 or 3 hours to drive off this hydrogen.

One of the important discoveries made in connection with NE steels is that shot peening of finished work increases fatigue life tremendously in such parts as springs, axle shafts, tank track pins, and other parts which are subjected to similar stresses. This is one of the outstanding developments in metalworking within the past few years, and will have an important future, particularly in a postwar industrial world which will continue to use lower alloy steels than were in use before World War II.

The machinability of NE steels is improved by cold working, provided the correct microstructure is obtained and the amount of cold working is not excessive. Often a reduction of a few

thousandths of an inch will be sufficient.

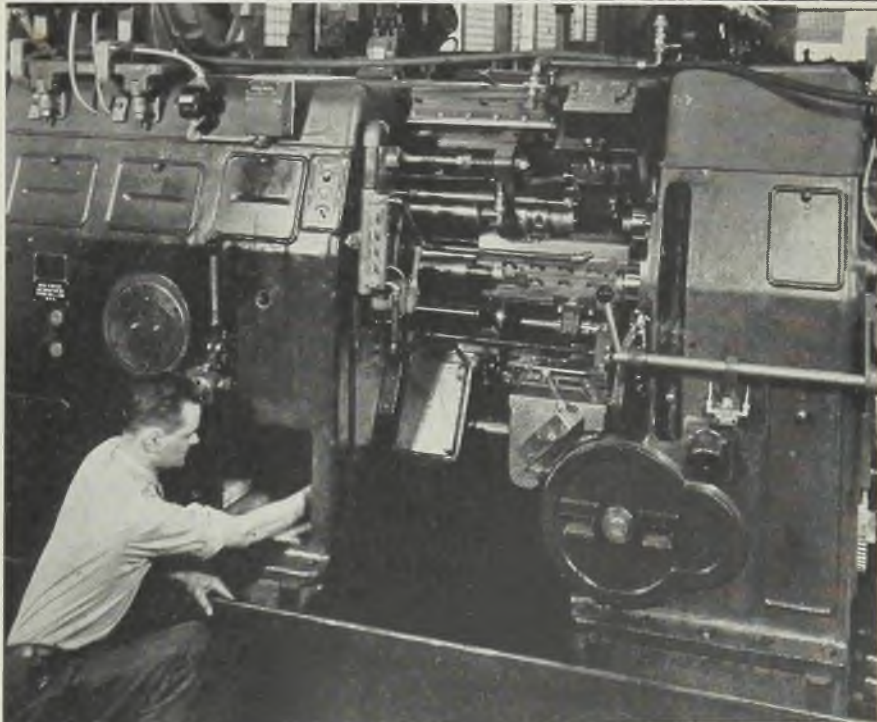
Depending upon the manner in which steel is annealed, its structure will be made up of coarse lamellar pearlite, fine pearlite, spheroidized cementite, or various mixtures of these structures.

Of the three, the softest and most ductile is the spheroidized structure, the next softest is the coarse lamellar pear-

lite, and the hardest is the fine pearlite. Any NE steel which is to be subjected to severe cold working (such as cold drawn tubing which is worked inside and outside) should have a spheroidized or soft structure.

On the other hand, if the steel has a spheroidized structure but the amount of

(Please turn to Page 128)



(Above)—Electrolytic descaling and tin plating NE steel gears by the Bullard-Dunn process. Equipped with indexing mechanism to regulate its circular movement, this merry-go-round has hydraulic piston to lower the work into or lift it out of the tanks. Note arrangement of tanks and dipping racks in relation to loading and unloading station

(Below) — Putting the finishing touches on an Acme-Gridley machine. Nearly all the alloy steel parts in this tool are made of NE steels

# EXPANSION

. . . . become more useful in making permanent assemblies because of new developments in chilling methods and equipment. New units go to 140 degrees Fahr. below zero

SINCE the early days of metalworking, making a *shrink fit* by heating the outer section of the assembly and letting it shrink onto the inner piece has been employed to produce permanent assemblies. One of the first and still most common applications is the shrinking of a hub onto a shaft. Another is the shrinking of tires onto locomotive drive wheels.

On the other hand, *expansion fits*, obtained by cooling the inner section of the assembly and letting it expand into the outer section, have not been so widely employed, partly because of the practical difficulties involved in obtaining a temperature low enough to be effective. Re-

cent developments in chilling, however, are changing this picture, as will be pointed out.

Then too, some assemblies are joined by both *shrink* and *expansion*, heating the outer section and cooling the inner. Thus the term "shrink fit" as commonly used also refers to *expansion* as well as *expansion-and-shrink* fits.

**Shrink vs. Force Fit:** When a pin, shaft or other part is forced into a hole of slightly smaller diameter, such a force fit is usually restricted to parts of small or medium size. Also it is desirable that the entering end be tapered slightly to start the fit. Where the fit is of comparatively large diameter in relation to its axial length or where the part cannot be tapered, a force fit can quickly become an awkward and difficult job.

Too, the possibility of distorting one or both members being joined may make a force fit undesirable. Or if an ex-



Fig. 1 (Above)—Both expansion and shrink are utilized here, the outer member, an aircraft landing strut, is expanded while the inner member, a plug, is shrunk. This makes it practical to assemble the parts by hand, eliminating scoring which resulted from previous press fit

Fig. 2 (Left)—Bronze bearing liner is shrunk for expansion fit into this diesel engine piston. Mechanical refrigeration reported to save \$3000 monthly over previous methods of shrinking. Deepfreeze Division photos

# and SHRINK FITS

Extremely tight fit is required on a large diameter and axial length, the force fit pressure involved may exceed the pressing capacity of available equipment. These are some of the factors involved in choosing between force and shrink fits in making an assembly.

To press a tire over a locomotive drive wheel without heating would be a tough job. On the other hand, a pin is easily and quickly forced into a hole at room temperature with a hydraulic press.

**Tighter Assembly:** Shrink fits are often preferred over force or press fits because of the considerably tighter assembly that results. One test<sup>1</sup> to determine the difference in quality between shrink and force fits showed that the resistance of the shrink fit to slippage was 3.66 times greater than that of a force fit, for an axial pull. Torsional resistance was 3.2 times greater. In both instances, dimensions and tolerances of the parts were the same.

**Extends Fatigue Life:** Another factor that may dictate the use of a shrink fit is the readily demonstrable fact that scratches or scoring invariably produced in making a force fit serve as stress raisers, reducing the fatigue strength of the parts joined. This can be of great importance in items for airplane engines and other highly stressed parts.

**Allowance and Clearance:** In designing a shrink fit, there are two things that must be determined—the *allowance* and the *clearance*.

*Allowance* is the amount the diameter of the inner member exceeds that of the outer member at room temperature. It is this excess diameter, sometimes called *interference*, that produces the pressure developed in the completed shrink fit.

When making the shrink fit, the inner member is shrunk past the point where its diameter equals that of the hole into which it is to go. This excess shrinkage is the *clearance* required to assure easy assembly of the parts.

According to one authority<sup>1</sup>, a smaller allowance is generally used for shrink fits than for force fits, although some shops use the same values. Certain classes of work use even larger allowances, making still tighter final fits. In any case, the allowance may vary considerably with the form and construction of the parts, the amount of metal around the hole in the outer member being the most important factor.

An allowance of 0.001-inch per inch of diameter is reported<sup>2</sup> as representing average practice where a tight permanent fit is desired. Too much allowance will result in developing such high contact pressures as to tend to crush

the inner member or rupture the outer one. Insufficient allowance produces light contact pressures that may not prevent slippage of the parts. Allowances of 0.0005 to 0.0010-inch per inch of diameter appear to be best practice. (This figure does NOT include clearance. Minimum allowance plus clearance is 0.002-inch of diameter—giving a light press fit or a "drop" fit if assembly is made quickly.)

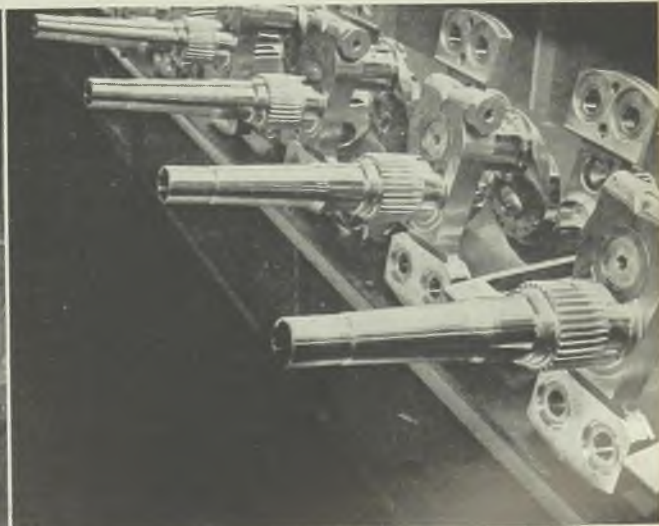
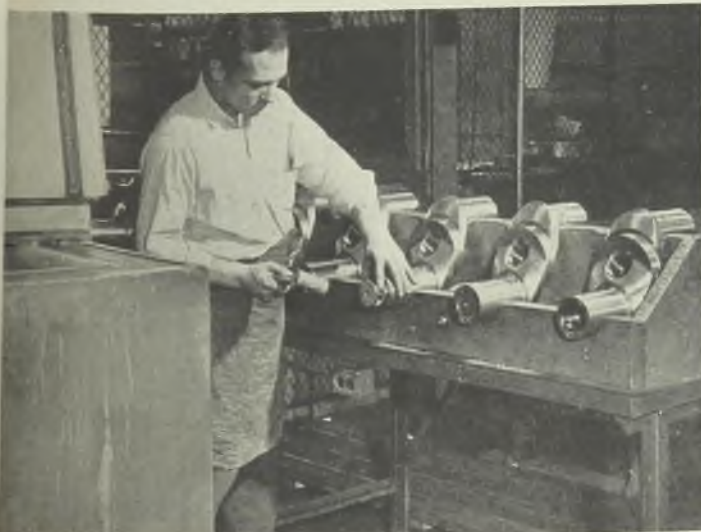
Various recommendations on amount of allowance for shrink fits are given in handbooks and textbooks<sup>1,3</sup>. It also is possible to calculate the allowance required to produce any particular value of contact pressure that may be desired<sup>2,4</sup>. Much practical information on designing shrink fits is also available from various manufacturers<sup>5</sup> of chilling equipment and supplies. Some data also is given in Tables III and IV.

**Clearance:** As for amount of *clearance*, that depends upon how easily the parts are to go together in making the assembly. Thus the clearance may be anything from 0.001 to 0.004-inch per inch of diameter. Where considerable axial length is involved, the larger clearance may be desirable. If the fit involves a comparatively short axial length and a larger diameter, the smaller clearance may be satisfactory. The examples below give typical values.

**Temperature Differential:** With allowance and clearance determined, the amount that the part must be shrunk to make an expansion fit (or expanded to make a shrink fit) is known, since it is the sum of these two values. Then knowing the coefficient of expansion of the material, it is easy to determine the *temperature differential* that must be developed between the two parts in or-

Fig. 3 (Below)—After shrinking in refrigeration cabinet at left at 35 degrees Fahr. below zero, plugs are inserted in section of aircraft engine crankshaft

Fig. 4 (Right below)—These crankshafts for Wright radial aircraft engines have a number of parts held in position by expansion fits including a plug (Fig. 3), four dowel pins, counterweight bolt bushing, and jets for directing oil flow. Ohio Crankshaft photos



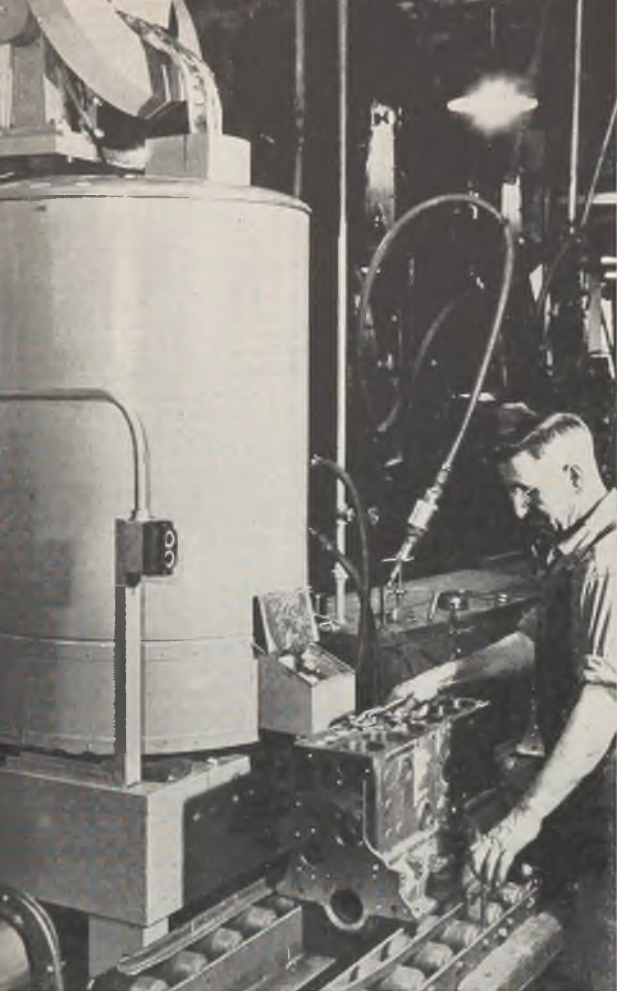


Fig. 5—Standard Deepfreeze unit converted for production line assembly use by Dodge Division of Chrysler Corp. Every time operator trips control lever, a valve insert ring chilled to 120 degrees below zero is discharged ready for assembly into exhaust valve holes, six to an engine block

TABLE I—AQUEOUS CHILLING SOLUTIONS (FREEZING MIXTURES)

Anhydrous Material	Per cent Mixture with Ice	Eutectic Temperature Deg. Fahr. Below Zero
Calcium Chloride (Ca Cl <sub>2</sub> )	29.8	67
Cupric Chloride (CuCl <sub>2</sub> )	36.0	40
Ferric Chloride (FeCl <sub>3</sub> )	33.1	67
Hydrogen Chloride (HCl)	24.8	123
Potassium Hydroxide (KOH)	31.5	85
Sulphur Trioxide (SO <sub>3</sub> )	32.0	103
Zinc Chloride (ZnCl <sub>2</sub> )	51.0	80
Sodium Chloride (NaCl)	23.3	7

Note: See reference No. 5 at end of this article.

low zero, and sodium chloride (salt) and ice, providing a limit of 7 degrees below zero. Table I lists other eutectic mixtures, giving the per cent of the anhydrous material with ice and the lowest temperature so attainable.

One factor that must be carefully considered in selecting such a mixture is the chemical reaction of the material with the metal part being chilled. A method of obviating this difficulty is to mount the parts to be chilled on a rack or place them in a wire basket and suspend them just above the surface of the bath. In this way, the work will be chilled, although not as rapidly as by direct immersion. This scheme is employed most frequently when working with the nonaqueous solutions shown in Table II. The idea is to cut down on the amount of liquified gas used in cooling the work, since considerable amounts of the bath can be lost by the extremely vigorous boiling that occurs when the metal parts are first immersed in it.

**Liquified Gases** are quite commonly employed for getting the extreme cold temperatures desired in chilling certain sections. One reason is that they offer a practical means for obtaining the maximum shrinkage in the work by approaching a temperature somewhere near absolute zero (about 460 degrees Fahr. below zero). For instance, liquid air is listed as having a boiling point of 310 degrees Fahr. below zero.

**Minimum Temperature:** It is seldom practical to let the work stay in the bath long enough to come to exactly the same temperature as the solution in which it is immersed, because the decreased temperature differential between work and solution as the work cools results in slowing down the rate of heat transfer. Thus to get any volume of work through the solution, a few degrees temperature difference usually is tolerated. This means that ordinarily the work would be removed from the bath of liquid air at a temperature ranging from 260 to 290 degrees Fahr. below zero.

The same thing applies to other chilling solutions in that the work temperature obtainable is seldom the exact temperature of the bath. When working

der to assemble them properly.

For example, suppose the parts to be assembled are of a nickel-steel that has a coefficient of expansion of 0.000007—that means it expands 0.000007-inch per inch of length per degree Fahr. increase in temperature. (Coefficients of expansion are listed in many handbooks. An excellent list appears on p. 677 to 686, *Handbook of Chemistry and Physics*, 18th Edition, by Charles D. Hodgman, Chemical Rubber Publishing Co., Cleveland). Allowance for the shrink fit in this case is 0.001-inch per inch in diameter; while clearance wanted is 0.003-inch per inch of diameter; total, 0.004-inch per inch of diameter. (These are about maximum values.) Temperature differential required is found by dividing total expansion by coefficient of expansion, here 0.004 over 0.000007 or 571° Fahr.

**Heat vs. Cold:** This temperature differential could be obtained by heating the outside member of the assembly to 641 degrees Fahr., assuming a room temperature of 70 degrees which will be the temperature of the inner member; or if the inner member could be cooled to 501 degrees Fahr. below zero, the desired result could also be obtained. But that temperature is far below practical or even laboratory possibilities, so in this instance at least partial heating of the outer member would be necessary.

Perhaps heating the outer member to 641 degrees is not desirable because

of distortion that might result or some other factor. How much is it practicable to chill the inner member?

Remember, the fit we want can be made by any method that gives the required temperature differential—by either heating the outer member, by chilling the inner member, or by partial heating and chilling of both members.

**Time Delays:** It should be pointed out that calculated shrink values are based on assembling the parts while at certain temperatures. Any delay in assembling will result in rapid rise in temperature of the chilled part, with accompanying expansion. This factor can be overcome by chilling 20 to 30 degrees below the actual temperature wanted, or by increasing the amount of clearance in designing the fit.

**Chilling Solutions:** Low-temperature baths may be produced by mixing various substances with ice or solid carbon dioxide. These baths can be roughly divided into aqueous and nonaqueous solutions, Tables I and II. Also, low-boiling-point liquids develop extremely low temperatures by evaporation. See Table II.

Eutectic mixtures of anhydrous materials and ice produce temperatures down to 123 degrees Fahr. below zero, the value obtained with 24.8 per cent mixture of hydrogen chloride and ice. Aqueous solutions most commonly utilized for their respective temperature ranges are calcium chloride and ice, giving a limit of 67 degrees Fahr. be-

TABLE II—NONAQUEOUS CHILLING SOLUTIONS

Substance	Temperature Obtained Deg. Fahr. Below Zero
Alcohol, Carbon Dioxide Ice	98
Chloroform, Carbon Dioxide Ice	106
Ether, Carbon Dioxide Ice	148
Liquid Air, Boiling Point	310
Nitrogen, Boiling Point	321
Oxygen, Boiling Point	297
Hydrogen, Boiling Point	422
Helium, Boiling Point (Approx.)	450
Absolute Zero	460

(Low temperatures are produced with these materials by mixture with solid carbon dioxide or by evaporation of low-boiling-point liquids)

Note: See reference No. 5 at end of this article.

TABLE IV—AMOUNT OF SHRINK WITH SOLID CARBON DIOXIDE AND ALCOHOL, INCHES PER INCH OF DIAMETER

Metal	Initial or Room Temperature		
	50 Degrees	70 Degrees	90 Degrees
Aluminum	0.00130	0.00150	0.00170
Brass	0.00104	0.00120	0.00136
Bronze	0.00130	0.00150	0.00170
Cast Iron	0.00065	0.00075	0.00085
Copper	0.00117	0.00135	0.00153
Lead	0.00208	0.00240	0.00272
Monel	0.00091	0.00105	0.00118
Nickel	0.00078	0.00090	0.00102
Steel	0.00078	0.00090	0.00102
Zinc	0.00195	0.00225	0.00255

In practice not more than about half of the above contraction can be considered, because even with rapid handling and fitting the part warms up and begins to expand. Data from Air Reduction Sales Co., New York.

with solid carbon dioxide and alcohol, for example, Table II lists a temperature of 98 degrees Fahr. below zero. Yet for all practical purposes, a temperature of 90 degrees below in the work is about the minimum obtainable.

**Dry Ice And Alcohol:** One of the most economical and efficient mediums for producing low chilling temperatures is a mixture of alcohol and solid carbon dioxide (commonly known as Dry Ice, the trade mark of Air Reduction Sales Co., New York). According to the maker, this material has a temperature itself of 109 degrees Fahr. below zero, so it affords an excellent medium for chilling, either alone or with alcohol. Sometimes it is used with kerosene to give temperatures of about 60 degrees Fahr. below zero, but that is not recommended because the alcohol mixture provides a much lower temperature, about 90 degrees below zero.

Temperatures obtainable in the work run from 80 to 97 degrees Fahr. below zero, according to length of time the metal parts are allowed to remain in the solution.

**No Dilution From CO<sub>2</sub>**

Solid carbon dioxide sublimates (or melts) directly to produce carbon dioxide gas without forming a liquid. This is one of its most important physical characteristics because it means that the alcohol never becomes diluted and so may be used over and over again. Absorbing some 247 B.t.u. per pound, Dry Ice is commercially available in 10-inch cubes weighing about 50 pounds each. See Table V for recommended practice. U. S. Industrial Chemicals proprietary alcohol-type solvent, Solox, is recommended for use with Dry Ice.

Such mixtures of solid carbon dioxide and alcohol are widely employed for shrinking parts several inches in diameter and larger. On the other hand, small diameter parts usually require chilling in liquid air (—290 degrees Fahr.) to get enough contraction. Dr. G. V. Slotman, manager, Applied Engineering Department, Air Reduction Sales Co., New York, points out that practical considerations thus account for the common use of solid carbon dioxide and alcohol for shrinking parts 4 inches

or more in diameter, with liquid air being used for smaller diameters.

**Insulation:** While insulated cabinets to hold chilling solutions are available from a number of sources, many users prefer to design them to fit their own particular needs. In any case, proper attention to providing effective insulation is of utmost importance if operating costs are to be kept in line. Especially is this true when using liquefied gases, for much "cold" can be lost by leakage through walls of a poorly insulated container. Often doubling or tripling the cost of the container by insulating it more effectively will pay out within a few weeks by saving valuable liquefied gas.

**Shape:** Most efficient thermally is the container shaped like a tube stood on end. The reason is simple—the circular cross section provides the largest cubical content for a given wall area; or stated another way, it involves the minimum wall area for a given cubical content. This means cost of insulating will be less than for a rectangular tank. And what is more important, the cost of operation will be less because with a given heat leakage per

TABLE III—SHRINKAGE GUIDE

This table gives approximate shrinkage of rings or cylinders 2 inches in diameter when chilled from 70 degrees down to 100 degrees Fahr. below zero, for various metals listed. Obviously, the shrinkage for rings or cylinders of other dimensions can be found by proportion: the larger the diameter, the larger the shrinkage. Shrinkage for other chilling temperatures can be found in a similar manner; smaller temperature differentials producing less shrinkage.

Material	Shrinkage, Inch
Tool steel	0.0022
Phosphor bronze	0.0032
Aluminum bronze	0.0032
Brass	0.0036
Aluminum	0.0043
Magnesium	0.0045

(This data from Deepfreeze Division, Motor Products Corp., North Chicago, Ill.)

square foot of tank wall less heat will flow through into the chilling solution. Depth should not be much greater than diameter if minimum ratio of wall area to volume is to be obtained.

**Mechanical Refrigeration:** One of the important advances in chilling methods has been the advent of small compact mechanical refrigeration units capable of going down to 120 or 140 degrees

TABLE V—RECOMMENDED PRACTICE FOR SHRINKING WITH SOLID CARBON DIOXIDE AND ALCOHOL

**Temperature:** Metal parts can be chilled to 97 degrees Fahr. below zero by this method, although in practice, a temperature of 80 below is more easily obtained; longer periods in the bath produce lower temperatures.

**Size of Parts:** The following procedure is suggested for cold shrinking metal parts more than 4 inches in diameter. Smaller parts are best shrunken with liquid air in order to obtain sufficient contraction.

**Container:** Use a water-tight insulated container of a size to provide a clearance of at least 2 inches around the work to be shrunk. Shape of container should conform to shape of the work. Wooden blocks may be used to fill voids. Sides of container should extend at least 6 inches above alcohol level when work is immersed to allow for "boiling" of the alcohol without spilling over when the dry ice is added.

**Chilling:** The dry ice is broken up, preferably in a burlap bag, and dropped into the warm alcohol. These broken pieces will sink to the bottom of the container, and in subliming (melting) the carbon-dioxide gas given off will cause the alcohol to "boil" or hubble violently. This agitation is helpful in speeding up the transfer of heat from the work to the solution. Keep the solution bubbling by adding more dry ice.

Metal parts to be shrunk are immersed in the cold bath until sufficiently chilled. When parts are removed, the fit should be made immediately. If any delay occurs and the parts have a chance to warm up, even partially, they should be chilled again before attempting to make the fit. Otherwise there is danger of the part seizing when inserted only part of the way. Speed is important. Above data from Air Reduction Sales Co., New York.

Fahr. below zero. Principal advantage of such equipment is its low operating cost. Of course, its primary application is in production work where a considerable number of parts are to be chilled regularly, as in shrinking parts of automotive and aircraft engines.

It is important to provide means for rapid transfer of heat from the work to the refrigerant. This means most mechanical refrigerators for shrinking utilize a bath of alcohol, oleum spirits, or other liquids into which the metal parts will be immersed to chill them.

Chlorinated hydrocarbons also work well. Most suitable are trichlorethylene (freezing at 126 degrees Fahr. below zero) and methylene chloride (-142 degrees Fahr.). Both are nonflammable and have no flash point.

In addition to greatly speeding up the rate of heat transfer, use of such a bath provides a reservoir of "cold" which improves the efficiency of the operation by spreading out the heat load on the equipment, since it acts to remove the peak loads on insertion of

a new group of parts into the liquid.

Mechanical motion of the bath obtained by means of motor driven agitators is also helpful in assuring fast heat transfer and uniform temperatures throughout the baths. Automatic controls on most units maintain temperatures within plus or minus 2 to 4 degrees.

**Chilling Units:** A number of manufacturers have developed standardized refrigeration units especially designed for use in making shrink fits. Kold-Hold Mfg. Co., Lansing, Mich., reports installations of single units that save as much as \$1000 yearly over other methods of chilling.

Of the standard refrigeration cabinets working down to 90 degrees Fahr. below zero produced by this company, a dual unit features compartments—one for a hot bath, another for the chilling bath—separated by a "knee-hole" bench which provides a convenient work table for assembling the parts after they have been prepared. The standard unit can chill 140 pounds of steel from 70 above to 40 de-

grees Fahr. below zero in 1 hour, at the same time heating 275 pounds of steel from 70 to 200 degrees. Temperatures of 60 degrees below zero are obtained with proportionately lower loads.

Possibly lowest temperature reached by standard chilling units (those made by Deepfreeze Division, Motor Products Corp., North Chicago, Ill.) is 120 degrees below zero, with a 140-degree unit now being developed. See STEEL, Dec. 27, 1943, page 70 for details.

Case history illustrating application of such units is furnished by Erwin Maus, Deepfreeze of Cleveland. He relates how a manufacturer of diesel engine pistons required some means for permanently fastening a bronze SAE-64 wrist pin bushing in place in the piston, Fig. 2. Bushing is 3.3190/3.3185 inches outside diameter, which is approximately 0.0055-inch larger than the hole (3.3140/3.3135) in the piston at room temperature.

A simple shrink fit was first attempted, expanding the piston by heating. This proved undesirable because it distorted the cylinder as well as being cumbersome.

Then chilling the bushing to about 65 degrees Fahr. below zero was employed using solid carbon dioxide in kerosene. (Alcohol should have been used with resulting -90 degrees.) The 0.0025 to 0.0030-inch shrink obtained resulted in shaving off small particles of the bushing when it was pressed into the hole in the piston. And it became tapered somewhat in the process. Result was that the assembly proved unsatisfactory, for it easily lost wall pressure and allowed the bushing to work loose.

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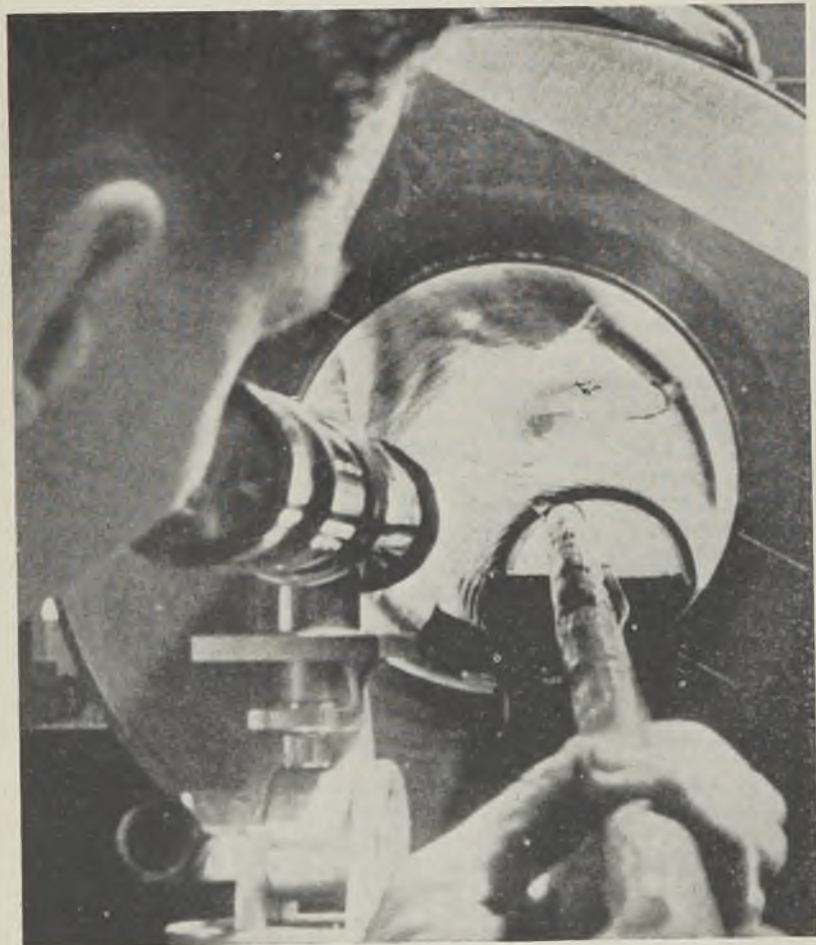
Finally liquid air was employed, the work being allowed to cool until it reached a temperature of about 260 degrees Fahr. below zero. This worked exceptionally well, giving all the clearance necessary for easily assembling the parts yet developing full pressure between bushing and piston upon reaching room temperature. However, it was quite costly. Even so, this method was employed for years.

With the advent of mechanical refrigeration going down to 120 degrees Fahr. below zero, this means of chilling was tried and found to produce the desired shrinkage . . . and it saved up to \$3000 per month over former methods, reports Mr. Maus. And one man now handles the operation instead of the two previously required.

Also production has been considerably increased, and spoilage of parts greatly reduced. Only an extremely light press fit is required to assemble the bushings into the pistons. So satisfactory was the first chilling unit that a second was added within a year to increase output.

**No Distortion:** A principal advantage of chilling as compared with heating for shrink fits appears to be in the elimination of the distortion which often occurs upon heating a part. On the other hand, cooling to 120 degrees Fahr.


(Please turn to Page 133)



**TELESCOPIC BURRING:** Slight irregularities or burrs in the rifling whorls of a 5-inch anti-aircraft gun barrel are found and scraped smooth with the aid of this telescope, a mirror and two lights at the Louisville, Ky., naval plant operated by Westinghouse Electric & Mfg. Co. Barrel of the gun is flood-lighted and telescope is trained upon the mirror set under the offending area at the proper angle to reflect rifling curvatures out of the telescope's focus.

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Fig. 1—Appearance of the surface of hardened and tempered carbon spring steel after shot blasting, shown at 12 diameters

# Shot Blasting

... prolongs life of leaf, torsion and helical springs

By H. H. CLARK

Spring Division  
Eaton Mfg. Co.  
Detroit

THE SHOT BLASTING of springs as a means to promote increased fatigue life has been recognized and practiced for many years. The advantages to be obtained from blasting were recognized from the outset; but extensive acceptance of the process has been delayed until recent years, when better equipment and methods of control were developed and a better understanding of the process was made available. J. O. Almen of the Research Laboratories Division of General Motors Corp. has been outstanding in developing the scientific objectives of the shot-blasting process by postulating the basic elastic theory involved and by showing the necessity for controlling and measuring the operation in order to obtain optimum results.

In basic terms, shot blasting is effected by slinging round chilled iron shot at a relatively high speed against the surface of the work in process. Considerable experimental work is in progress to determine the proper size of shot and speed of impingement with respect to the size of the work being blasted in order to obtain the best results, but for most springs current practice is to use shot of 0.025 to 0.030-inch diameter and an impingement velocity of about 200 feet per second. In consequence to the impingement of the shot, the surface of the work assumes a rough, pock-marked appearance due to the brinelling of the shot, much as if the work had been pounded by innumerable minute ballpeen hammers as shown in Fig. 1.

The peening action of the shot causes the surface of the metal being blasted to stretch in all directions during the time of impingement. This causes a plastic flow of the surface fibers which are stretched beyond their yield point in tension. Fibers a rather short distance below the surface, however, are not stretched to their yield point and retain their elasticity. After impinge-

ment, these inner fibers force the outer fibers to return to a shorter length than the length at which the overstrained outer fibers tend to remain; and the equilibrium which results finds the outer fibers subject to a residual compressive stress while the inner fibers are in tension.

Experimental work by several investigators indicates that the residual compressive stress extends to a depth of 0.005 to 0.010-inch below the surface and that the value of the compression stress on the surface is several times

that of the tension stress in the interior of the section.

The compression stresses which are caused to exist in the unloaded state by the shot-blasting operation directly reduce the tension stresses produced by the bending of such springs as leaf springs and torsion springs. The residual compression stresses do not affect the value of the shear stresses existing when helical springs such as automotive valve springs and chassis suspension coil springs are loaded; but on the other hand, the residual compression stresses respectively decrease the tension component and increase the compression component of the shear stress. In both cases, the net effect is a gain in life, an index which lends credence to the concept advanced by J. O. Almen that fatigue failures result from tension stresses, never from compressive stresses.

In the shot blasting of springs, the Eaton Mfg. Co. pays particular attention to the development and selection of equipment for the proper exposure of the work to the blast stream. The details of the equipment, therefore, are varied to suit the type of spring to be blasted, but the use of high speed slinger wheels is common to all units. The shot flows by gravity through a feed tunnel into the hub of the slinger wheel. The shot then travels from the hub to the periphery of the slinger wheel along radial blades, gaining momentum as it moves outwardly by centrifugal force along the rapidly revolving blades. A control cage between the feed tunnel and the slinger hub permits adjustment of the direction of the blast stream.

After impingement on the work, the shot falls to the bottom of the blast chamber from which it is carried by conveying and elevating means to an overhead storage. From the storage point the shot again travels by gravity to the feed tunnel and the impeller to repeat its working cycle. Means are

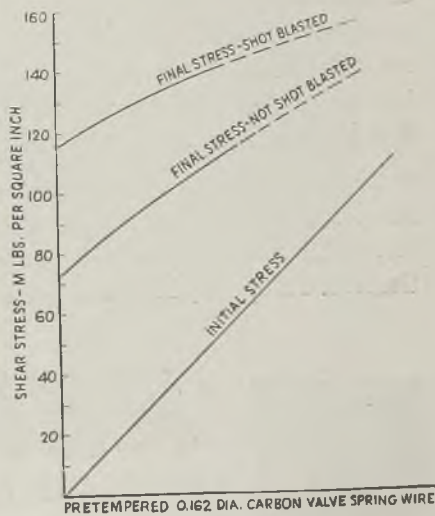
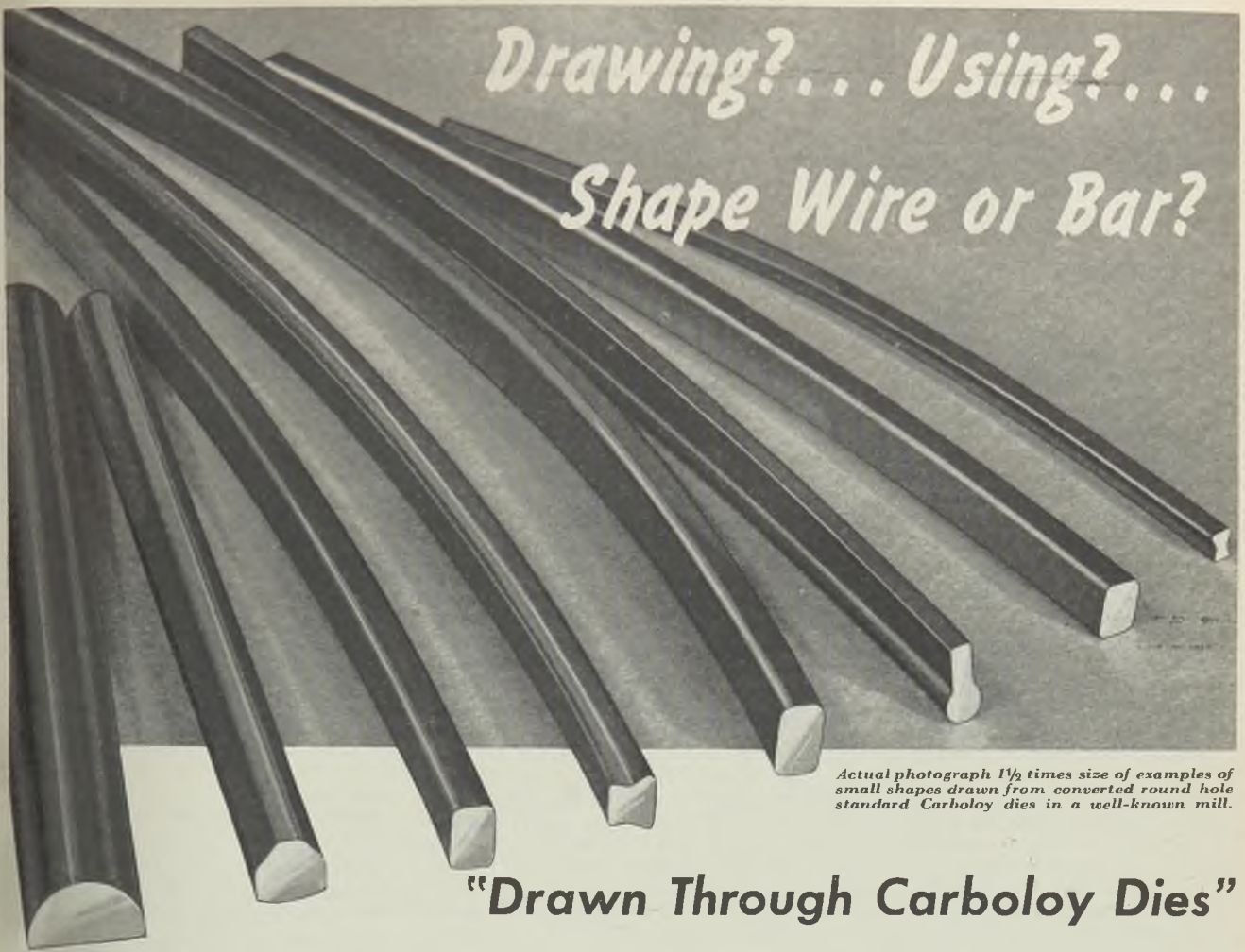


Fig. 2—Modified Goodman diagram showing final stress to which a spring may be subjected for any given initial stress in the operating cycle, the spring to have indefinite life without failure

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provided to exhaust the dust incidental to the operation, and to provide for the removal of scale, dirt and fine broken shot.

The practice at Eaton is to convey large coil springs through the blast stream by a conveyor chain arrangement carrying pins, which push the springs axially as the springs rotate on two revolving pipes. Medium size coil springs are shot blasted in equipment similarly arranged, the main difference being that narrower faced slinger wheels are used as less shot feed is required.

Smaller coil springs, such as automotive and aircraft engine valve springs, are treated in another manner whereby pins on a conveyor chain cause the springs to roll through the blast stream, the axis of the springs being normal to the major axis of the shot stream. Still smaller coil springs, as well as small flat springs, spring stampings and other items which do not permit individual exposure to the blast stream are blasted in a tumbling chamber which tumbles and cascades the work beneath the slinger wheel. The individual plates of leaf springs are blasted as they are carried through the blast chamber by a conveyor chain arrangement containing pins over which the center bolt hole in each plate is inserted. It has been found necessary only to shot blast the concave, tension side of leaf spring plates to obtain optimum results.

If shot blasting is performed in a careless, haphazard manner, the operation degenerates into a mere cleaning operation having slight, if any, measurable effect on fatigue life. Every effort must be made to assure that the shot be kept in good condition and be used generously; that sufficient impingement time is allowed, and that the equipment

be maintained in satisfactory operating condition. Maintenance costs are high and the operation is by no means a cheap one; but the overall expense is nominal when one considers the return in terms of results.

It is apparent then that the shot blasting must be subjected to controls to make sure that optimum results are being obtained in production. The degree of blasting to be given any particular design of spring can be determined by judgment based on a background of fatigue testing of similar springs, but the control of this degree of blasting involves many factors.

The shot blasting of leaf springs is more amenable to control than that of coil springs. In the case of leaf springs, the shot blasting produces a change in the curvature (increases the curvature) of the plate. This change in shape requires that the plates must be formed initially to a lesser radius of curvature than is required to carry the specified loading in the finished state. Gaging the shape of the plates after shot blasting by one means or another, is therefore a valuable indicator or guide for use in controlling the shot blasting of leaf springs.

The control for shot blasting coil springs is more difficult, as there are no measurably apparent external distortions to serve as a guide to show amount of peening action that has taken place. For coil springs, however, use can be made of flat strips fastened to a heavy flat base by set screws, and passed through the shot blasting machine in a manner assuring that the same impingement is given the strip as is given the surface of the spring. After release from the base, the impinged surface becomes convex and the curvature can be

measured. Such control specimens, as developed by J. O. Almen, can be used to facilitate production control of any type spring so long as care is exercised to assure that the specimens are subjected to the same impingement as the springs.

Some idea of the advantages of shot blasting where endurance life is concerned can be obtained by considering the modified Goodman diagram of Fig. 2. This diagram shows the final stress to which a spring may be subjected for any given initial stress in the operating stress cycle, the spring to have indefinite life without failure.

Spring were made from pretempered ASTM 230-41 carbon valve spring wire of 0.162-inch diameter and were fatigue tested after half the total number of springs had been shot blasted while the remainder received no surface treatment. It is to be noted that the shot blasting increased the endurance limit above zero stress from 72,000 to 115,000 pounds per square inch.

Another point of interest concerns itself with the spread in fatigue life of springs made from the material used in the determination of the endurance diagram of Fig. 2. In each case, 33 of these springs when tested through a range of stress from zero to 120,000 pounds per square inch showed a comparative scatter in the cycles for failure as follows:

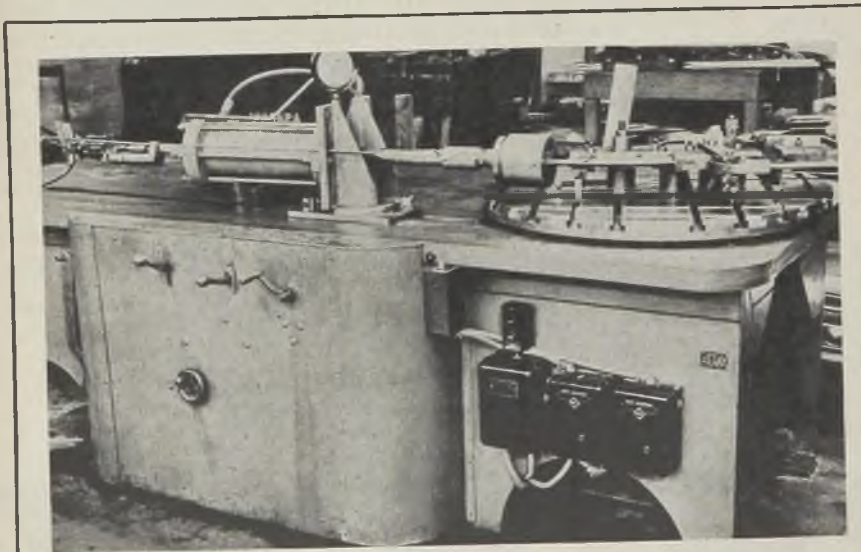
Cycles	Shot Blasted	Not Treated
Minimum	400,000	40,000
Maximum	5,000,000	200,000
Average	2,000,000	50,000

Numerous investigators have found that the scatter obtained in their fatigue test results increases as the test stress approaches the endurance limit. In the test of the shot blasted springs in a zero to 120,000 pounds per square inch test cycle, the spread from the longest life to the shortest was 20 to 1. But note that the endurance limit was zero to 115,000 pounds per square inch—very close to the test stress. When the untreated springs were tested through the same test stress range, the corresponding scatter was 5 to 1. The endurance limit was but zero to 72,000 pounds per square inch for these untreated springs.

In testing shot-blasted springs against untreated springs through a given stress cycle, therefore, one should expect a greater scatter in the test results of the shot-blasted springs as the endurance limit of the latter is raised and approaches the test stress in value.

There is some experimental evidence to indicate that minor surface imperfections which are harmful to untreated springs, can be tolerated in the shot-blasted product. Perhaps the reason for this tolerance lies in the 0.005 to 0.010-inch deep compression layer existing on the surface of the metal due to the peening action of the blasting. However, any seams or other defects which

(Please turn to Page 137)



**ROTO-STRETCHER:** This unusual machine has been developed by Good-year Aircraft Corp. to bend and stretch metal parts for aircraft. Supplanting an earlier parts forming system which employed conventional metal dies and a considerable amount of hand labor, this piece of equipment shapes wrinkle-free parts with speed and economy never attained before. Arrangement of keyways across face of mandrel permits wide range of adjustment in positioning radius pins

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New Batteries and New Carbon Pile "Interruptor"  
Permit Development of . . . .

# "STORAGE BATTERY" WELDING SYSTEM

WHAT IS believed to be the first practical direct-current resistance welding system for using *storage batteries* as a source of welding current has been announced by Progressive Welder Co., Detroit. It is already in use, welding aluminum for aircraft assemblies. Actually, the use of batteries as a source of "stored energy" for resistance welding involves no radical redesign of already available welding machines, since modified types of standard welding machines or guns may be used in combination with the storage battery power unit.

It does make possible, however, the application of resistance welding even to aluminum, in localities where power supply limitations have prevented the use of other forms of stored energy welders. The only requirements are sufficient power to operate a battery charger. Compared with other forms of stored energy welders, furthermore, it is reported that the use of batteries for the power source means a material reduction not only in initial cost of the welding installation but also in operating costs, particularly as to current consumption, maintenance costs and cus-

tomary supervisory requirements.

Other advantages of the use of storage batteries for welding are reported to include:

—Elimination of inductive losses in the welding "loop" by use of direct current.

—Elimination of reactance losses between power supply and electrodes.

—Less critical adjustments to get consistently good welds.

—Greater operating and maintenance simplicity.

**Why Storage Batteries:** Welding engineers have long known that storage batteries would provide an ideal source of welding current *if* it were possible to accurately interrupt and control the current and *if* batteries could be made to stand the day-in and day-out service required from resistance welding equipment. Batteries, they knew, would provide a more reliable and constant source

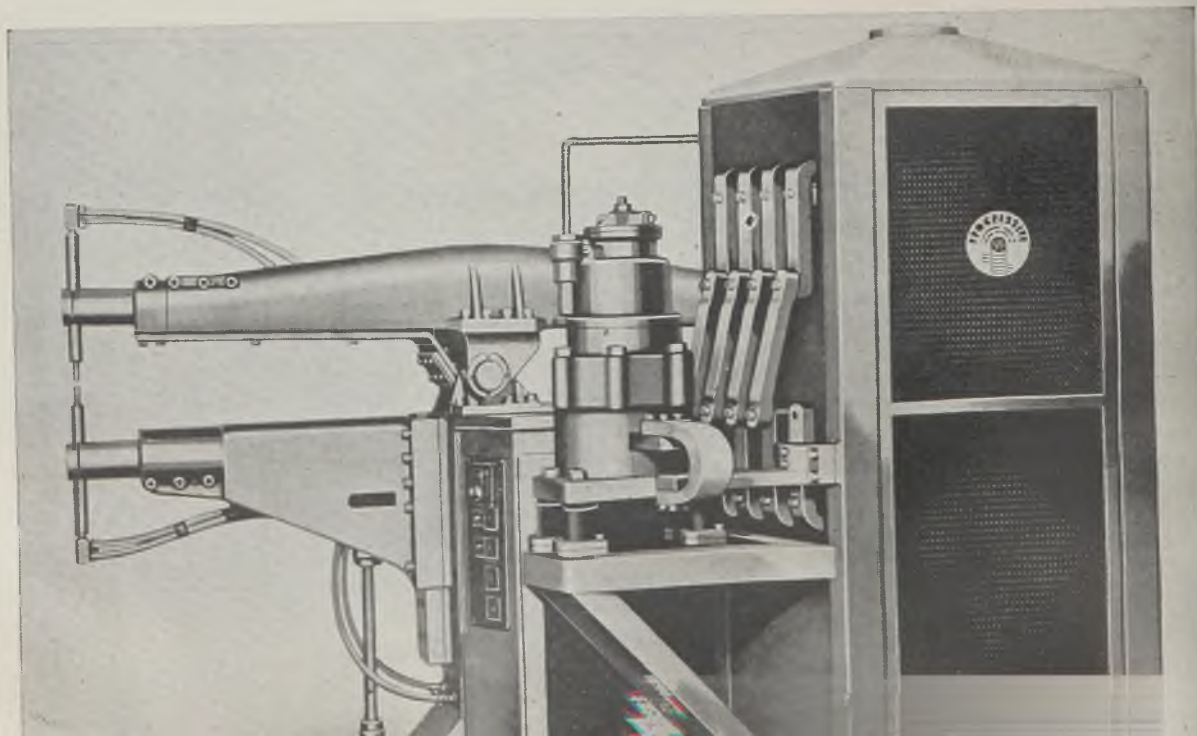
of power of low voltage, as required for resistance welding, eliminating need for transformers, synchronous controls, etc.

Development of storage battery operated welders has been predicated on two new developments: The creation of a special battery design which will withstand high repeated discharge rates and the development of a contactor-controller which will control and interrupt enormous amounts of current, if required, without arcing.

The first of these developments—a new type of storage battery—is largely a war development, having been evolved from batteries designed to meet certain naval requirements. The second—the contactor-controller—is said to be simplicity itself. Any good mechanic can maintain and service this contactor-controller without extensive training, it is claimed.

**Operation of the Welder:** Several types

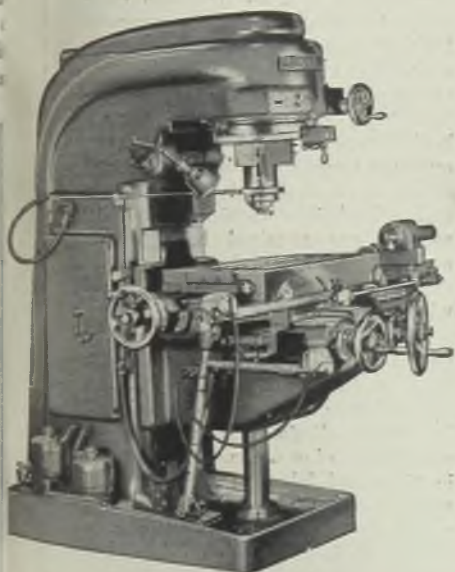
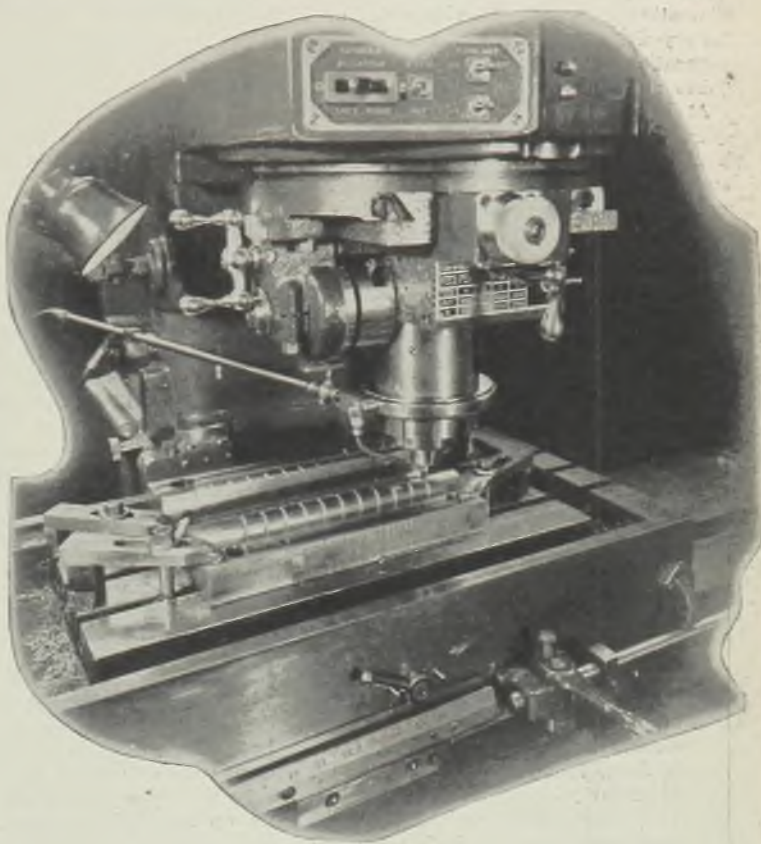
*Complete system for spot welding with storage battery power. Cylindrical device on shelf extension is the new "interruptor" and carbon pile especially designed for this application. It employs air-line pressures to develop as much as 25 tons in the pile when making a weld. Releasing pressure builds up resistance in circuit, interrupting heavy welding current without arcing*



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The Milwaukee Rotary Head Miller equipped with a cherrying attachment made "short work" of the "tricky" milling required on this injection mold. It took just two hours to complete the job — far less time than by any other method known.

The cherrying attachment is an auxiliary rotary head, mounted at 90° to the head of the miller. It is used to mill circles and angles in a vertical plane. When used with rotary head motion, spherical and conical cavities can be accurately and rapidly milled — in almost all cases difficult operations become a comparatively simple task.



## KEARNEY & TRECKER'S ROTARY HEAD MILLER

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**DIRECT** . . . mills mold cavities in a single set-up without the aid of templates or models.

**ACCURATE** . . . chances for error are eliminated because there is no change in set-up. Exact control of all combinations of cutting movements — possible only with this machine—

transmits mathematical precision to the work.

**FAST** . . . initial job preparation and set-up time is reduced to the minimum. Accurate performance of the machine saves operator's time and rapid production of intricate molds and dies is the result.

*Write for Bulletin No. 1002C for complete information on the Milwaukee Rotary-Head Miller and the accurate and rapid production of all types of molds and dies.*

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of resistance welders—rocker arm, pedestal and gun types—may be used in combination with the storage battery power unit. From the operator's standpoint, the actual welding procedure is similar to welding with conventional machines.

Power to keep the batteries charged is supplied from a normal "power line"—which may be either single or 3-phase alternating current. The charger is of the dry-disk rectifier type, provided with automatic controls. It normally requires no attention.

At the welder itself, only a simple non-synchronous sequence welding control is needed. This, together with an automatic pressure switch on the welder and a "starting" pedal-operated switch, controls the weld cycle. Control of the actual amount of welding current is furnished by the contactor-controller.

This unit is capable of making and breaking tens of thousands of amperes of direct current at low voltage without arcing, and of controlling the current with a single adjustment—that of pressure. Its principle is that of the well-known carbon-pile, although pressures in the contactor may be as high as 25 tons when welding aluminum for in-

stance. Usual factory air supply lines are sufficient to provide this pressure when required.

In this contactor, representing a new application of an old principle, the current is automatically varied by changing and controlling of pressure. When the pressure on the contactor drops to zero, current automatically stops flowing—making possible interruption of the welding current without arcing.

**Electrical Characteristics:** An idea of the efficiency of the equipment may be gained from the fact that the voltage drop from battery to electrode is only a fraction of that usually encountered. Direct current of low voltage provides a constant effective value of welding current which has the advantage of making weld characteristics less dependent on accuracy of control of time cycle.

Elimination of inductive losses in the welding loop means that current passing through the weld will be exactly the same, regardless of how deeply a panel is inserted in the throat of a welder, thereby assuring greater weld consistency. Elimination of reactance losses between power source and electrodes is reflected in the vast reduction in volt-

age drop between power source and electrodes. The only reactance loss in the storage battery type of installation is that due to the low electrical resistance in the cables and conductors.

Of particular importance in plants where other forms of equipment aside from welders are being operated is the fact that storage battery welders operate with virtually unity power factor. This makes unnecessary the installation of corrective electrical equipment in the plant to compensate for high momentary loads on the power line. The low and constant line load imposed by the battery charger makes the equipment readily adaptable to communities where power supply is limited.

The simplicity of the contactor-controller and the elimination of transformers, synchronous heat controls, etc., make it possible to maintain the equipment with only a normal amount of mechanical skill, it is claimed. Under normal production schedules, batteries require inspection and addition of water supply only about once a week. In addition, a somewhat lesser degree of skill is required also on the part of welding equipment operators.

## Handling Cut 80%

THE PROBLEM of armature-dipping, draining and baking was studied by officials of D. W. Onan & Sons, Minneapolis, with the idea of saving maximum time and labor. They found that five loading operations were necessary before a given job was ready to leave the baking department. That was a lot; in fact, too much.

Eventually they worked out a system which requires simply that the coils, stators or armatures be placed in a load-rack and left there until they are ready to be removed and sent out for cleaning. Briefly, this is the system:

Three Despatch coil-and-armature baking ovens mounted together as a battery face a varnish-tank booth

which is fully enclosed and has a double door. Between the varnish booth and the line of ovens there is an open area about 18 feet across.

In this open area Onan engineers set up an overhead tramrail system which allows seven racks of work to be shuttled back and forth and switched to any desired position (in any of the ovens, draining pans or varnish booth).

There are three main tracks extending from inside each oven to a point at the nearest wall. Cutting at right angles across these three tracks is a transfer bridge. This bridge can be swung from one position to another and locked into place in a few seconds, thus transferring a rack in shortest possible

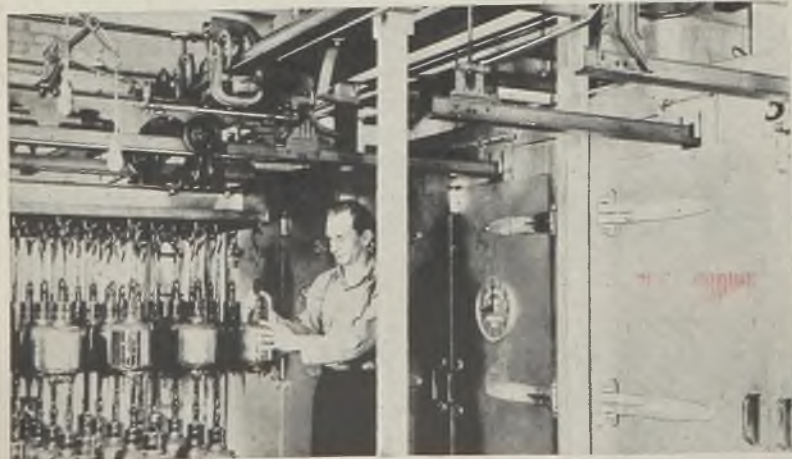
time. Tracks left "open" by movement of transfer bridge have automatic safety latches so that derailment is impossible.

Each of the seven racks is equipped with ball-bearing wheels which travel on rugged steel overhead tracks. Coils, stators or armatures are suspended by hooks from the top of each rack. This holds them firmly during varnishing, draining, baking, redipping and rebaking.

The entire carrier system was designed and installed by Onan engineers, including immersion apparatus for lowering racks into the varnish tank. This consists of a continuation of the main track of the tramrail system into the varnish booth. When a loaded rack is rolled into booth, an operator turns an air-hoist valve and entire track-section descends to immerse load into varnish. About 10 seconds are required for lowering rack into tank. Another valve raises the load back to main-track level when impregnation is complete.

Cleveland Tramrail supplied the necessary rails, switches and other parts of the carrier system used. The net saving in the carrier system alone has meant eliminating four handling operations, plus an enormous saving in time and labor as well. And by using seven load-racks, all three ovens can be kept in operation constantly, if desired, with no delay between charges.

*View of forced convection drying and baking ovens in Onan plant with a portion of the monorail system with tracks leading into each oven*

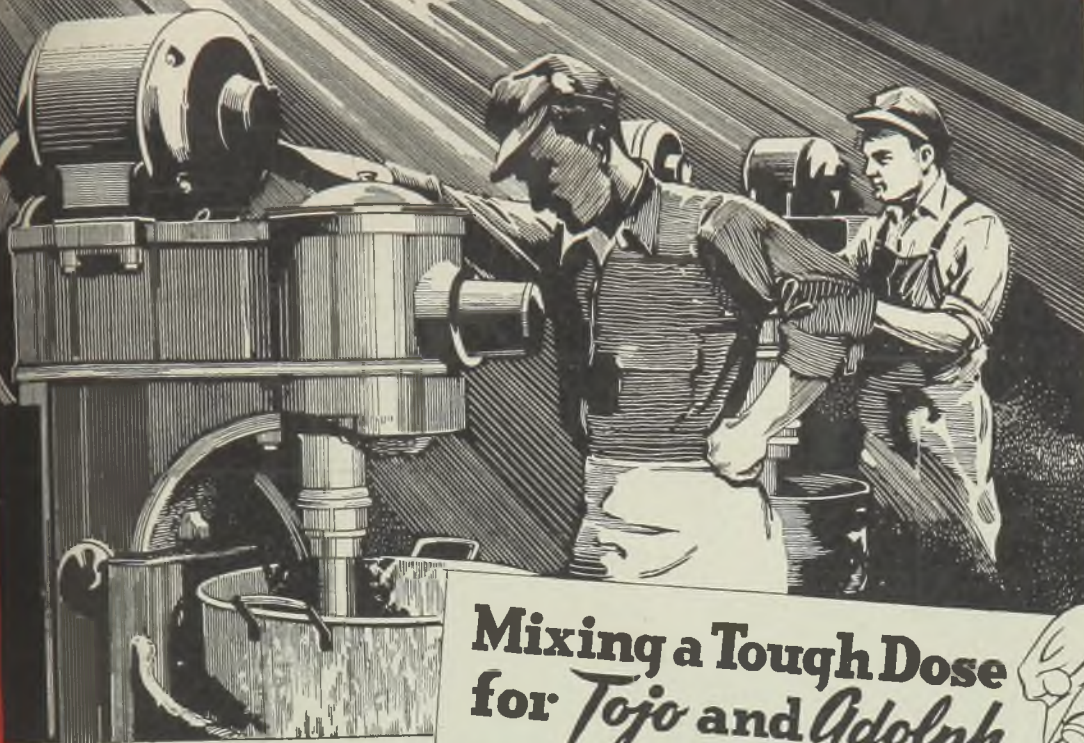




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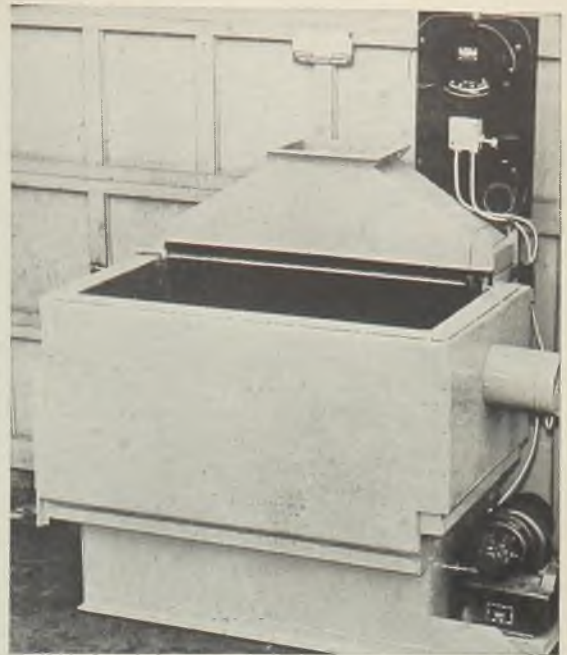
# Black-Oxide Finishes

By MARK WEISBERG

President  
And

EDWARD A. PARKER

Alrose Chemical Co.  
Cranston, R. I.



Oil heated tank for blackening  
solution, automatically controlled.

Heil & Co. photo

SALT-SPRAY tests on various supplemental coatings applied over black-oxide finishes show an extremely wide variation in additional protection afforded. All black-oxide coatings are less than 0.0002-inch thick and are slightly porous. Thus, for most uses, other than very mild indoor environment, it is necessary to use supplemental coatings such as oils, greases, waxes, lacquers or paint.

Before analyzing the test results, perhaps it would be well to briefly describe black-oxide coatings and how they were obtained. The black-oxide coating itself increases the resistance to corrosion (compared with bright steel) from 50 to 2000 per cent. Reference to the accompanying table will also show that the supplemental coatings provide additional protection, the value of which ranges throughout a ratio of 1000 to 1 when comparing the best to the poorest.

The black-oxide coatings referred to here are obtained by immersion in chemical oxidizing baths. All the oxide proprietary processes now on the market involve either one or two baths and use the same controls and salts. Sodium hydroxide is the principal ingredient with nitrates or nitrites, or mixtures of these, as the other essential materials. The operating temperature of the bath depends upon the proportions of materials used.

The one-bath system contains approximately 55 per cent salts and boils between 285 and 300 degrees Fahr. Temperature is the factor utilized to control the coloring action of the bath.

The first bath of the two-bath system is approximately the same as above. The second bath of a two-bath system is more concentrated, employing 62 to 64 per cent salts and boiling between 310 and 315 degrees Fahr.

Differences in the effect of the one-bath and two-bath systems can be generalized by saying that usually the two-bath system is capable of producing twice the penetration, wear resistance and the salt spray resistance of the one-bath method.

### Preliminary Rinsing Necessary

When a supplemental oil film is applied, the work is taken directly from the rinses which follow the oxide baths and is placed into a hot soluble oil of suitable composition and concentration. Then the work is allowed to drain and dry. Effective preliminary rinsing is necessary to prevent a rapid build up of alkali salt in the soluble oil which will lower the protective value of the supplemental coating. This factor also requires the replacement of the soluble oil with reasonable frequency.

In treating steel, the amount of carbon has little effect on the coloring power of the baths until the cast iron

range is met. Some cast irons do not color well. High carbon steels and malleable iron take excellent black finishes.

Increasing the hardness of a steel decreases the coloring power and penetration of the salt baths.

Presence of chromium in small amounts has no detrimental effects on the coloring action. The presence of as little as 1 per cent nickel, however, will effectively prevent any coloring action.

**Supplemental Protection:** Certain oil finishes when applied over the black-oxide surface greatly increase its corrosion resistance. Results of tests made on steel plates coated by various processes are shown in the accompanying table.

In making these tests, a rubber lined steel box was used. The salt-spray solution was operated at 95 degrees, plus or minus 2 degrees Fahr. Air pressure at the spray nozzle was kept at 10 pounds. The brine was adjusted to 20 per cent, specific gravity 1.151 at 60 degrees Fahr. once a day. Two baffles placed in opposite directions were used to break up the direct spray so only the mist contacted the test panels.

The test panels were mounted vertically in wooden racks, the triplicate panels for each test distributed uniformly throughout the box. After each examination, the racks were moved forward one position and the front rack placed in the rear to eliminate any irregularities of salt mist distribution.

Each panel was evaluated every 3 hours for the first 24 hours of exposure and then once every 24 hours thereafter. With the exception of the wax and air-drying lacquers, the oiled black-oxide panels were allowed to dry overnight before placing in the salt-spray box. A total of 54 rust preventative solutions

(Please turn to Page 136)



Specimens mounted in salt-spray  
cabinet for corrosion resistance test

Characteristics of various drives and recommendations for choosing the most efficient type as well as control equipment are cited in this the concluding installment of Mr. Thurman's treatise on drawbenches. In the two preceding articles the author dealt with multiple-mandrel and bar-type benches—their ratings and component parts; benches used for working ferrous and nonferrous materials; and the newly-developed drawbench of the continuous type

# Drawbenches ...

## Their Operation, Uses and Drives

### Part III

**Single-Speed Motor with Eddy-Current Clutch:** Squirrel-cage or synchronous motors can be used with eddy-current clutches to obtain adjustable speed for hooking and reduced drawing speeds. In effect, this is an artificial means of providing slip on the output shaft to make possible the low-speed operation. This drive is essentially a constant torque device whose speed of operation is dependent upon applied torque as well as upon the direct-current excitation applied to the exciting coil of the eddy-current clutch.

The output shaft of the unit is coupled electrically to a member which rotates at normal motor speed. The speed of the output shaft then depends upon the amount of excitation applied to the coil mounted on the rotating member. With high direct-current excitation, the slip of this member is low and it rotates at essentially motor speed, while when the excitation is reduced slip increases and speed decreases. The rotating member of the clutch must dissipate most of the losses. At top speed, with only about 2 or 3 per cent slip, the losses are low, but when speed is reduced, losses go up approximately in proportion to reduction in speed. Thus, for speed ranges of 3:1 or 4:1, the size of the eddy-current clutch must be increased to enable it to dissipate the additional losses.

For accelerating drawbench service, this drive is inherently better for drawing at top speed. Losses in deceleration and acceleration are high, but if it is necessary to draw at reduced speed

Fig. 14—Comparison of adjustable voltage and tapered rating constant potential D-C drives for 35,000 and 50,000-pound accelerating drawbenches

By A. L. THURMAN  
Industrial Engineering Division  
General Electric Co.  
Schenectady, N. Y.

the resulting efficiency will be greatly decreased. In general, the size of the eddy-current clutch rotating member is high, resulting in high  $WR^2$ , and slow acceleration. This indicates low bench productive capacity, but this type of drive may have advantages over the single speed non-accelerating bench. The drive itself is complicated mechanically and is difficult to service and maintain.

### How Acceleration Is Determined

In addition to the high inertia of the drive, the accelerating speed is also determined by the rate at which the torque applied across the air gap of the magnetic coupling can be changed. This rate of acceleration can be increased by forcing the excitation system, but if

this is done, the rate of heat dissipation of the rotating member of the clutch is likely to be exceeded, causing overheating of the unit.

Some source of direct-current supply is required for control of the eddy-current clutch; this is usually obtained either from a direct connected exciter or from a small motor-generator set.

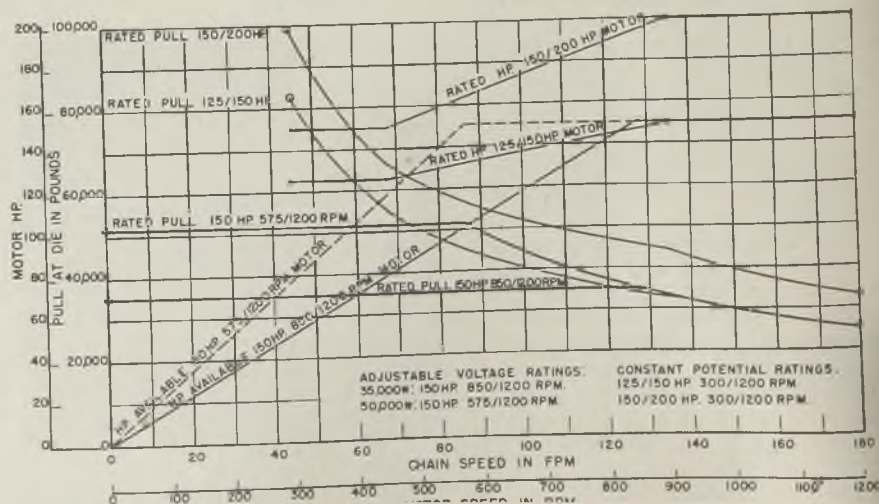
**Single-Speed Drive with Hydraulic Coupling:** This drive also has been considered for accelerating and variable speed drives. In general, it has roughly the same characteristics as the eddy-current clutch drive.

The hydraulic coupling works on a principle similar to that of the fluid drive now used in some automobiles. A means of control of the fluid coupling is provided so that the speed of the output shaft can be controlled in a manner analogous to that of the eddy-current clutch.

The fluid coupling is complicated mechanically and requires servicing and maintenance, although it is of simpler construction than the usual eddy-current drive.

The rate of acceleration of this drive is determined by inertia to be accelerated and the rate at which the fluid coupling can transmit accelerating torque. This drive is suitable for variable-speed operation where frequent acceleration is not required, but its efficiency decreases as the slip increases.

Characteristics of this drive are also



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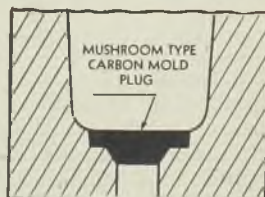
Sections of a machined graphite mold for centrifugal casting of small metal parts



Machined graphite mold



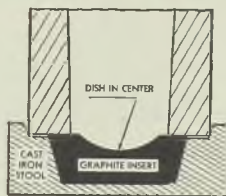
Standard tapered carbon mold plugs available in two sizes. (Other sizes on order)



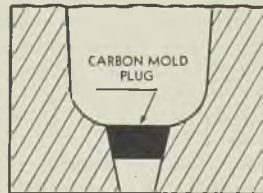
Mushroom type carbon mold plug. Like tapered plug, it replaces ceramics and metal



Showing a machined carbon or graphite slab, used as a stool insert to replace cast iron



Either carbon or graphite stool insert, with dished surface, to replace copper



Another view of standard tapered carbon mold plug, replacing ceramics or metal

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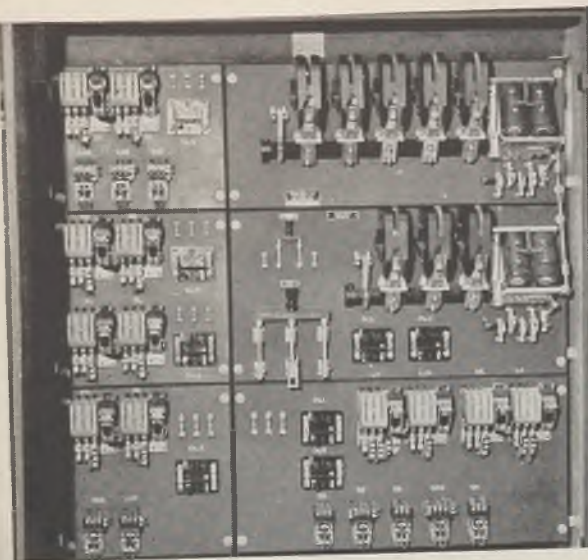


Fig. 15 (Above left)—A-C drawbench control panel for 200/100-horsepower main drive and miscellaneous auxiliaries

Fig. 16 (Above right)—D-C drawbench control panel for 150-horsepower main drive and 3-horsepower carriage drive

similar to those of the unbalanced voltage control for the wound-rotor motor in that the drive tends to accelerate to synchronous speed after load is removed, unless special provisions are made for maintaining the reduced speed.

**Adjustable-Speed D-C Motor:** The most common type of accelerating drawbench drive is the direct-current motor operated from constant potential using magnetic control, with accelerating speed range by field control. The most common speed range of these drives is 3:1, although a number have been used with 4:1 speed range.

Standard industrial type direct-current motors are commonly used for these drives. These motors have a rated commutating capacity of 150 per cent normal full load current, and control during acceleration usually is arranged to correspond to an accelerating rate near this value of current.

When service is unusually severe, adjustable speed self-ventilated auxiliary type mill motors can be used, the high commutating capacity of this motor can frequently be used to good advantage when high-speed acceleration is desirable; or where additional speed range is required, double-armature motors can be furnished.

A mechanical gear change is sometimes used to obtain a wide operating speed, but with an adjustable speed direct-current motor essentially constant horsepower is available throughout the speed range; this can result in dangerously high pulls at the low-operating speeds. By using a double armature motor the control can be arranged to provide for about 8:1 speed range with less pull available at the low-operating speeds. For instance a double armature 200-horsepower, 150/160 revolutions per minute motor with the armatures connected in series will provide 400-horsepower 300/1200 revolutions per minute with the armatures connected in parallel. This arrangement is a compromise since adjustable voltage is the ideal drawbench drive, and the added expense for the double-armature motor and control will be offset by the higher cost of a mechanical gear change.

On benches where it is desirable to provide a low hooking speed with a wide range of drawing speeds, a shunted-armature connection can be used. With this arrangement and the proper choice of resistor, it is possible to draw at the reduced speed, but speed regulation is poor and recommended practice is for the minimum drawing speed to correspond to motor base speed.

A common practice with the single armature adjustable-voltage drive is to choose a tapered rating so selected that from base speed to about 2:1 speed, the drive will be capable of overloading the bench. For loads above that speed, rated load on the motor will correspond to a decreasing pull on the bench in accordance with an essentially constant horsepower curve. With such a drive, then, the heavier tubing is drawn at speeds below 2:1, while light tubing is drawn at near the motor's top speed.

In choosing a direct-current drive for a given operating speed and load conditions, best accelerating service can be obtained by choosing the motor horsepower on about the same basis as that for the multispeed alternating-current accelerating drive. If the motor is operating at normal load when it reaches the drawing speed, it has had the 50 per cent excess commutating capacity to bring it up from hook speed to the operating speed. If a lower rated motor is selected, the time for acceleration up to operating speed becomes longer and in the extreme case the smaller motor will never reach the desired operating speed.

In any plant where a number of drawbenches are to be installed, the best practice is to provide sufficient conversion equipment for the direct-current drives and use constant potential throughout. The combined load and demand factors of a number of drawbench drives are relatively low; therefore a comparatively small total kilowatt of conversion

equipment can be used. Losses are low while the main drive is unloaded. Power is fed back into the system while the main drive is being decelerated.

The sealed-ignition rectifier unit substation has proven to be a good source of direct-current power for such plants. The floor space required for a number of benches will justify placing the units at various points near the load, resulting in a considerable saving of direct-current distribution copper and an improved voltage regulation.

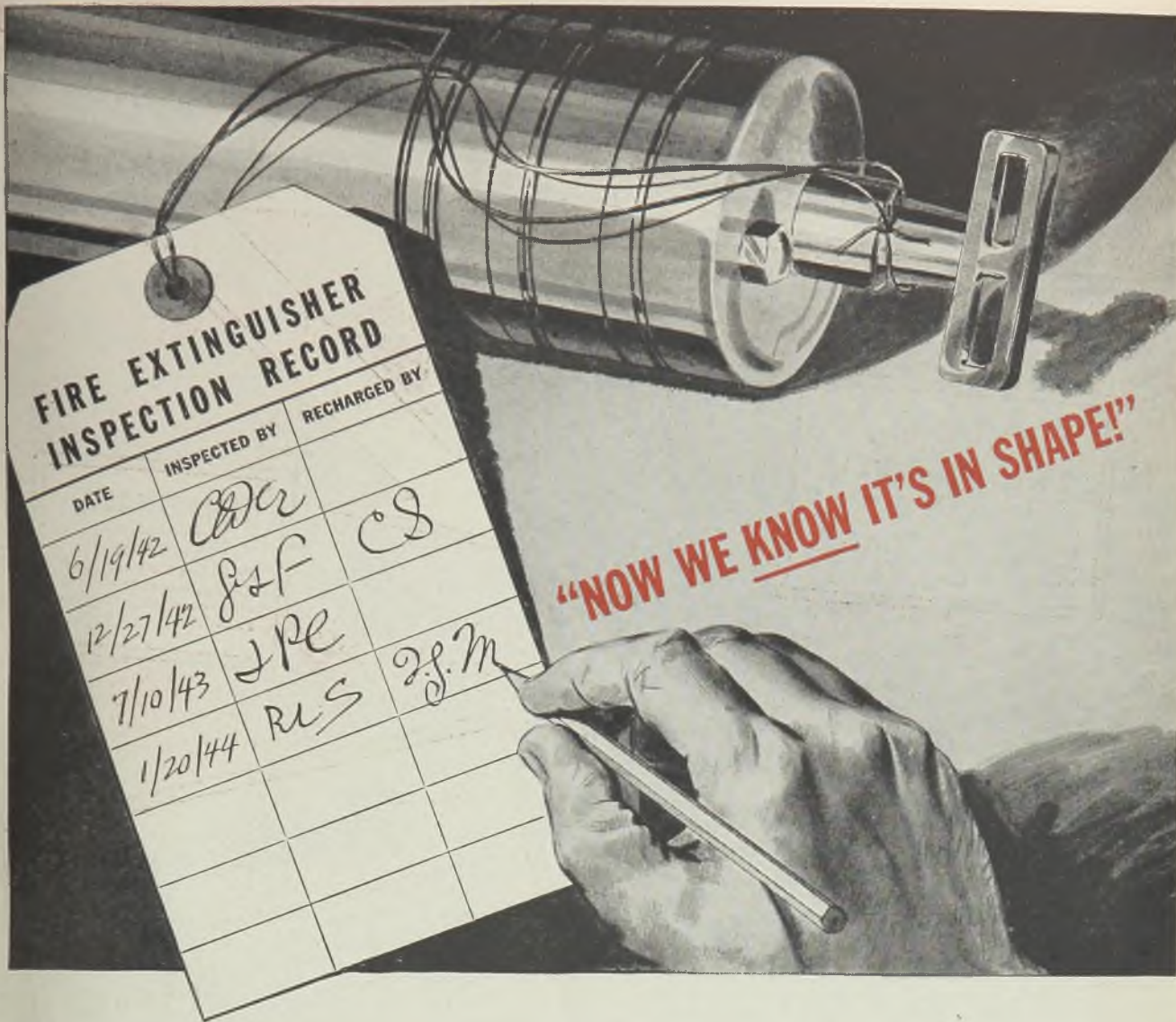
**Adjustable-Voltage D-C Drive:** Where only a few benches are being considered, and where only alternating-current power is available, the adjustable-voltage drive is the most satisfactory.

An accelerating drawbench is inherently a constant torque drive and is therefore ideally adapted to direct-current adjustable voltage. The proper choice of this type of drive eliminates the possibility of extreme overloads on mechanical equipment at reduced operating speeds and provides many other operating advantages. The drive is best suited to the condition where the material to be worked by the bench varies through types and sizes, requiring a wide range of hooking and drawing speeds.

With adjustable voltage, a higher base speed motor can usually be selected, resulting in a lower inertia drive and a consequent higher rate of acceleration.

Fig. 14 is an interesting comparison of two adjustable voltage and constant potential drives. To provide a basis for comparison all pulls are calculated at rated motor horsepower, assuming a 90 per cent mechanical efficiency of the bench. The curves for the tapered drives are divided roughly into three parts in accordance with their horsepower rating at the various speeds selected.

The values of pull shown favor the tapered rating constant potential drive



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# STEP-UP with YOUR PRODUCTION CARBURIZING Park No. 8 N.B. CARBURIZER

## PROVE it to Yourself!

Prove to yourself that Park's No. 8 carburizer is superior to charcoal-coke compounds for small parts. Send in your order today for a trial run.



## IMMEDIATE DELIVERY!

All orders for Park No. 8 carburizers can be shipped the same day they're received.

Manufacturers and commercial heat treating companies have been unanimous in their claims that Park No. 8 non-burning carburizer is far superior to other carburizing compounds for the production carburizing of small parts.

They base their claims upon the satisfactory results obtained in using Park No. 8 N.B. carburizer. They have found the fine texture of Park No. 8 to be ideal for thoroughly covering the smallest parts, thereby insuring uniform case depths at all times. A saving in labor was also effected by the elimination of:

1st: Hand packing operations;

2nd: Frequent changing of the carburizer (because No. 8 is non-burning it can be used over and over).

These advantages plus the added features listed at right prove that you can realize definite savings in carburizing small parts when you use Park's No. 8 N.B. carburizer.

For complete information and prices about Park No. 8 carburizer wire or write us today.

## ★ Features ★

- 1 NO REMIXING NECESSARY. Park No. 8 can be used over and over.
- 2 NO BURNING LOSS. Park No. 8 does not burn after dumping.
- 3 NO CHANCE TO EXPOSE PARTS THROUGH SHRINKAGE. Due to low initial shrinkage of Park No. 8 exposure of parts is not evident.
- 4 NO INDIVIDUAL HAND PACKING with Park No. 8. Parts can be shoveled into box.
- 5 TIME SAVED IN EMPTYING BOXES. Can be emptied by placing fine screen over drum and dumping.
- 6 UNIFORMITY OF RESULTS. Coke build-up eliminated; all parts covered by free flowing Park No. 8.
- 7 FASTER COOLING OF POTS. Hours saved by non-burning Park No. 8.
- 8 TIME SAVED IN CLEANING COMPOUND. Seldom necessary to clean Park No. 8.

**Park**  
PARK CHEMICAL CO.  
DETROIT - MICHIGAN

• Liquid and Solid Carburizers ☆ Cyanide, Neutral and High Speed Steel Salts ☆ Lead Pot Carbon ☆ Charcoal ☆ Coke ☆ No Carb. ☆ Carbon Preventer ☆ Quenching and Tempering Oils ☆ Drawing Salts ☆ Metal Cleaners ☆ Liquid Grain Cement

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as far as safety to equipment is concerned. These motors will be capable of developing at least 150 per cent of the torque corresponding to the top horsepower rating at base speed on the motor. For instance, the 125/150-horsepower, 300/1200 revolutions per minute motor will readily produce momentary torques corresponding to 150 per cent of 150 horsepower at 300 revolutions per minute. As far as commutating ability is concerned, the motor is able to meet the higher load at base speed, and with the control adjusted for the top horsepower, this higher torque will be available. The tapered rating is on a temperature basis and for continuous loading values, the curves are correct.

At the lower operating speeds, however, where little acceleration is required, a higher normal load could be drawn without overloading the motors from a duty cycle standpoint.

The curves shown probably would be satisfactory for most operating conditions, although some operators prefer to have full torque on the drive available up to the top operating speed. This can best be obtained by using adjustable-voltage motors with a horsepower corresponding to the rated torque at top speed.

#### Two Ratings Are Possible

It is interesting to note that with adjustable voltage it is possible to motor two ratings of benches with the same horsepower rating merely by changing the base speed of the drive. The 150-horsepower, 575/1200-revolutions per minute motor is capable of producing a 50,000-pound pull up to about 90 feet per minute. With the 125/150-horsepower constant potential drive applied to a 50,000-pound bench, it is capable of producing rated pull at about 75 feet per minute, which may be slightly low for some operating conditions and the 150/200 horsepower drive is therefore selected. This larger drive does offer the possibility of drawing 50,000 pounds up to about 107 feet per minute. A 200-horsepower, 690/1200-revolutions per minute motor would be capable of producing this pull up to 118 feet per minute.

With the adjustable-voltage drive it is therefore easier to suit the characteristics of the drive to those required of the bench without causing danger to the mechanical equipment. The lower  $WR^2$  of the armature for the adjustable-voltage drive will provide for more rapid acceleration and deceleration. The use of higher than standard direct-current voltage will often prove advantageous in suiting this drive to operating requirements. Greater operating flexibility is an important advantage of the adjustable-voltage drive.

On any adjustable voltage drawbench drive where continuous operation is likely to occur below base speed, consideration must be given to the ventilation of the motor; some duty cycles may suggest the use of forced ventilated motors. With this provision, it is then

possible to draw maximum torque from the motor at low speed, and since heavy tubing is drawn at lower speeds, the added expense of the ventilating equipment is justified.

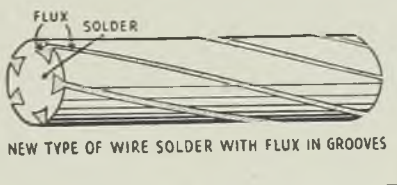
**Carriage Return Drive:** The rate of production of any drawbench is dependent upon the rate of speed at which the carriage can be returned to the die for the next draw and it is therefore important that due consideration be given this part of the bench.

The most common alternating-current drive is the two-speed, two-winding constant-torque motor rated at about

### Externally Applied Flux Features New Wire Solder

Containing flux in longitudinal grooves on the surface rather than in the conventional core, a new type of fluxed wire solder has been put on the market by National Lead Co., 111 Broadway, New York. Since the flux in the new product is outside, it liquefies and flows onto the work before the solder melts. This is said to insure thorough fluxing, to result in better and stronger solder joints and to obviate interruptions in the flow of flux. An additional advantage claimed for the outside location of flux supply is that it is always visible for checking.

The new wire solder, shown in accompanying illustration, is available in the same diameters as regular cored solder. It is obtainable in two compositions—red stripes on one type and green stripes on the other are an aid in properly identifying them for use.



1200/450 revolutions per minute, from 1½ up to about 10 horsepower. A high-slip, high torque, high thermal capacity rotor for this motor is recommended to provide fast starting on the high-speed winding, and full jogging torque on the low speed. To provide for a smooth speed change from high to low speed when the slowdown limit switch is tripped, torque cushioning resistors can be inserted in series with the low-speed winding. Some alternating-current driven carriages operate at 700 feet per minute on high-speed return.

For smoother and higher speed acceleration an adjustable-voltage motor has been furnished for driving the carriage. The speed-variator motor-generator set is commonly used for direct-current power supply, with control modified to meet the requirements of the application.

For best performance of the carriage

drive, the Thy-mo-trol (electronic motor control) has been used to good advantage. Controlled acceleration and deceleration, as well as IR drop compensation are provided. The smoothness of acceleration and slowdown on these direct-current drives usually will permit higher carriage speed and therefore higher bench output. The Thy-mo-trol offers the advantage of greater flexibility of adjustment to meet the optimum operating conditions.

Where direct-current power is available, the constant speed, compound wound motor is recommended; this motor provides high-speed return at normal speed, and slowdown by means of shunted armature connection. Some speed range can be provided, but the best performance is obtained by operating the motor at base speed. Compound wound motors provide higher torque for starting.

The need for a carriage brake can be eliminated by proper arrangement of the control for any of the foregoing three direct-current drives; a low stalled current on the carriage motor provides stalled torque to hold the carriage against the dieblock.

#### Selection of Carriage Motor

In selecting a direct-current motor for carriage return service, better performance usually can be obtained by using a higher rated intermittent motor so that the bench operator can avail himself of the higher accelerating torque. A motor rated on a one-hour temperature basis has the same thermal capacity as a continuously rated motor of the next lower horsepower but has the advantage of higher rated commutating capacity.

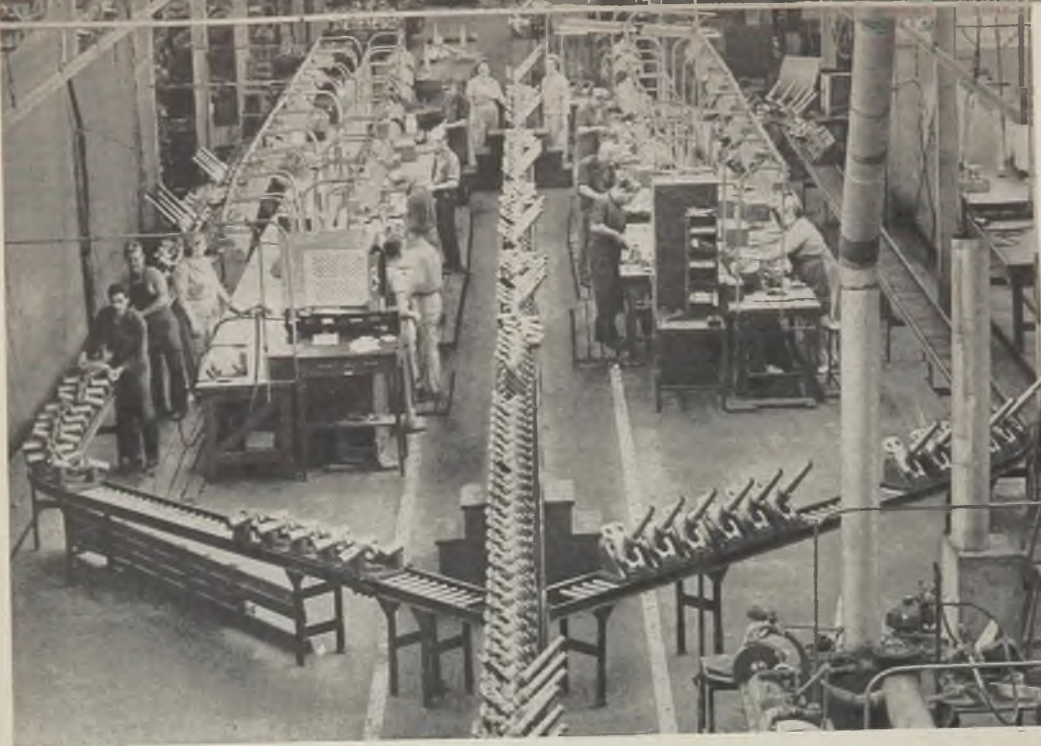
**Various Auxiliary Drives:** Frequently the tube loader or tube pusher drive is a direct-current motor, but this duty in most cases can be satisfactorily met by using an alternating-current motor. The high-torque motor is best for this application since operating conditions are sometimes met where the tube must be forced onto the mandrel, and considerable jogging of the drive may be necessary. However, for best overall bench operation, the tube's inside diameter should be enough larger than the mandrel plug that the tube can be easily threaded onto the mandrel; a higher production rate thus can be obtained, with less severe duty on the pusher motor.

The loading rack hoist, the mandrel lift, and mandrel rotating motors are usually high slip, high-torque motors depending on the duty some of these drives may be intermittently rated.

The pinch roll, mandrel adjusting, cam adjusting, hydraulic pump, push-pointer pump, and oil pump motors are usually single-speed, standard squirrel-cage induction motors.

Solenoid operated hydraulic and air valves are used for operating skid arms, for positioning and rotating mandrel rods, and for pushing tubing from the loading rack to the pusher track.

(Please turn to Page 130)



*Polishing department is served by three conveyor lines which branch out from a single conveyor entering the department as shown here. All tracks converge into one line again just beyond the department*

# GRAVITY CONVEYOR SYSTEM

... helps plant step up production schedules

WHEN a greatly stepped up schedule of aviation crankshafts came along to complicate the problem of materials handling, Ohio Crankshaft Inc., wartime subsidiary of the Ohio Crankshaft Co., Cleveland, installed more than 8500 feet of gravity conveyor to simplify operations. Results have been highly satisfactory.

Straight-line layout which features the two new war plants of Ohio Crankshaft's aviation division has become even straighter and the handling of the rough forgings on through to the finished shaft has been reduced immeasurably.

The first of four sizable additions to be made within the past two years by Ohio Crankshaft was constructed for the sole production of two-throw radial aviation crankshafts for Wright Cyclone 1700-horsepower motors. The plant was

By HARVEY SELLERS  
Production Manager  
Ohio Crankshaft Inc.  
Cleveland

considered "the answer to a production man's prayer", for in layout and equipment the best thinking and machine tools available were employed.

Original arrangement of the 315 new machines in the \$4,500,000 plant was based on an observation that a man able to tend three machines would have to walk 72 feet if units were placed side by side, but if laid out in triangular fashion, one on one side of the aisle and two

upon the other, he would walk only 14 feet. Thus a part zigzagged down the machining lines necessitating considerable handling from the special push trucks used exclusively to advance material. It was a system that functioned effectively yet required much paper work and bookkeeping. This latter has been reduced drastically and the zigzagging of material done away with entirely now that pieces move via conveyor. Also, the triangle relation of the machines has been replaced by side-by-side operation because there is no longer any "heavy hauling".

**Highly Precise Operations:** Machin-

*General view showing how conveyor lines tie the departments together. Note the monorail lines overhead. These carry electric hoists for loading the work into the machines from the conveyors*

